SCIENTIFIC AMERICAN

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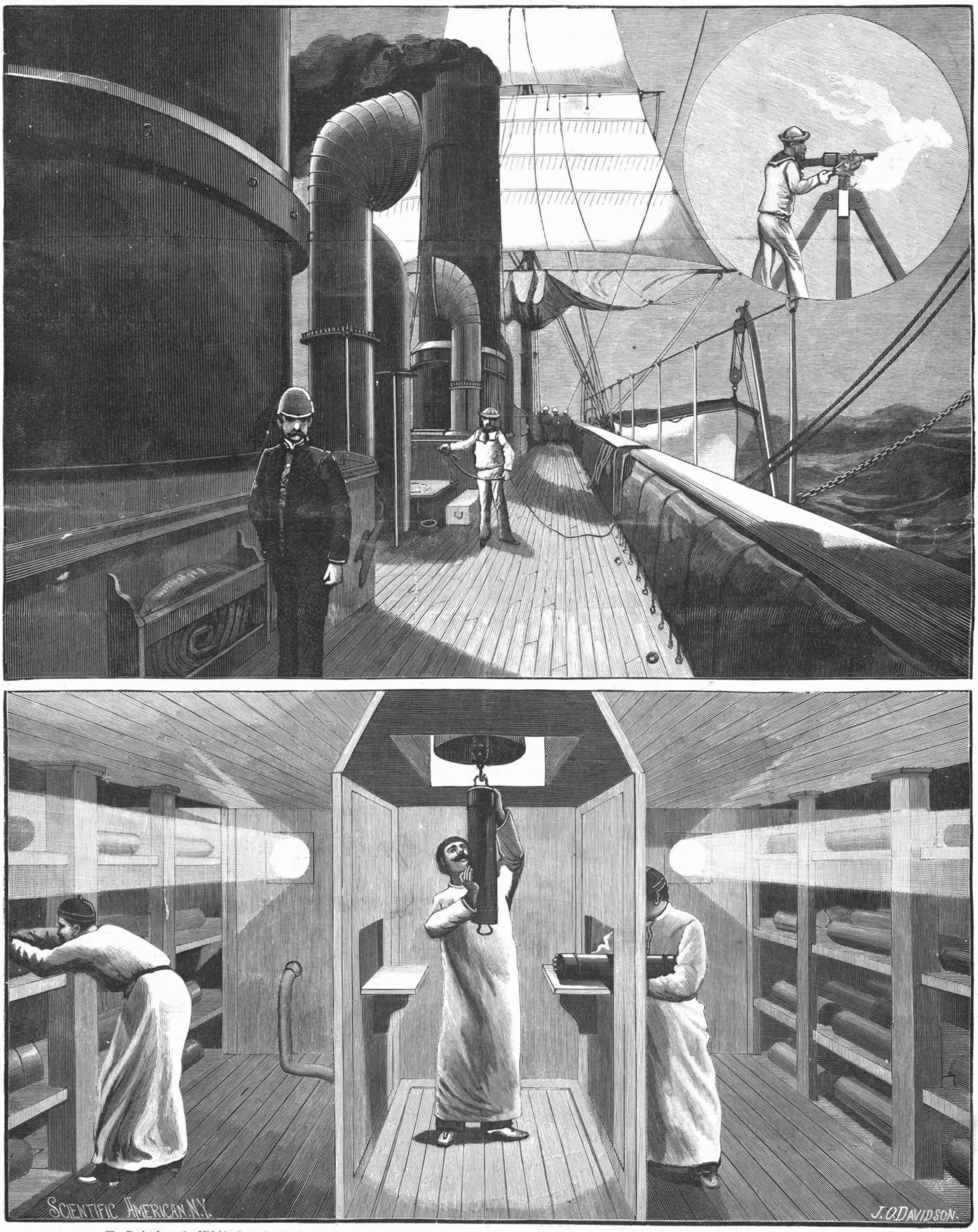

The Deck above the Midship Superstructure. The Magazine and Ammunition Hoist. A Rapid Firing Gun.

THE UNITED STATES CRUISER ATLANTA.—[See p. 375.]

Scientific American.

ESTABLISHED 1845.

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NEW YORK. SATURDAY, DECEMBER 15, 1894.

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(Illustrated articles are marked with an asterisk.)

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No. 989.

For the Week Ending December 15, 1894.

Price 10 cents. For sale by all newsdealers.

WORK OF THE LIFE SAVING STATIONS.

The record of the government Life Saving Service for the past year has been exceedingly gratifying. The number of disasters has been greater than in any previous year in the history of the present system. Superintendent Kimball, of the Service, states that 380 vessels in distress have received help. The total number of passengers on these vessels was 4,054, of whom 3,993 have been saved and but 61 of whom have been lost. The shipwrecked persons to receive shelter at the various stations along the coast number 658, and some 83 lives have been saved among those who have fallen from wharves or bridges. The value of the vessels and cargoes in distress is estimated at $10,000,000, and of this amount $7,688,000 have been saved. The cost of maintaining the system for the year has been $1,250,000, and the work has been considerably improved and extended.

AN INTERNATIONAL POSTAGE STAMP.

The German government is about to place a proposition before European countries relative to the issue of an international postage stamp. It is believed that such a stamp would be a boon to all who carry on any foreign correspondence. At present, if any one wishes information from a foreign country, he is unable to send a postage stamp for the reply, since no country will receive a foreign stamp as postage on an outgoing letter. One is therefore compelled to depend upon his correspondent's generosity to pay the return postage. The United States consuls in Europe, for example, are in receipt of thousands of letters of inquiry every year, not one of which contains postage for the reply. The German minister of posts has designed such an international stamp and has arranged a plan for its adoption. The stamp will contain the names of all the countries in which its value as postage is recognized, together with a table giving its value in the money of each of these countries. It is thought that only certain European countries will adopt this system, but it is to be hoped the United States will enter the agreement.

GOVERNMENT CONTROL OF RAILROADS.

The recent report of the Interstate Commerce Commission furnishes some very interesting data concerning the economic side of placing railroads under government control. According to these statistics, such management by the government has not in the majority of cases been found successful. At present there are in all 18 countries partly owning and operating the railroads of their countries. The most important of these are France, Germany, Russia, Australia, Japan, Norway and Sweden. In these countries the government fixes the tariff on all traffic, has power to revise these rates at will, and is compelled by law to reduce the rates when the earnings exceed a prescribed percentage. In the majority of cases this percentage does not exceed 15 per cent. The result of this system may be seen in part by the following significant figures. The cost of transporting freight in Great Britain is 2·8 cents per ton per mile, in France 2·2, in Germany 1·64, and in the United States 1 cent. In the case of the interest paid on the capital invested, however, England pays 4·1 per cent, France 3·8 per cent, Germany 5·1 per cent, Russia 5·3 per cent, Austria 1 per cent, Belgium 4·6 per cent and the United States 3·1 per cent. The advantage, it will be seen, is in favor of private rather than of government control. Several States, including Pennsylvania, Michigan, Indiana, Massachusetts, and others, have attempted to manage their railroads, but in every case without financial success.

CAST AND WROUGHT IRON FOR FRAME WORK OF BUILDINGS.

A trite definition of the age we live in describes it as the age of steel. Only a few years have elapsed since the production of steel was a very roundabout process, involving the long heating in a cementation furnace of wrought iron bars with nitrogenous organic matter. The wrought iron was generally produced from pig iron by the puddling process. When the steel bars were taken from the cementation furnace they had to be reforged, and if a perfectly uniform product was desired, the steel was melted in a crucible.

The inventions of Bessemer and Siemens have changed the aspect of the case. Now cast iron in quantities of five to twelve tons in the Bessemer converter is converted into steel in a few minutes. In the Siemens furnace steel is produced by melting down on the open hearth many tons of metal at once. In either process, the percentage of carbon can be regulated with great accuracy, and, notwithstanding the fact that pure iron is one of the most difficult substances to melt, either process can deliver melted steel of so low a carbon percentage as to be practically iron. The melting is so thorough that the metal flows like water.

The civil engineer and architect in times past executed their work with the most brittle of substances. If the foundation of a brick or stone building settle ever so little, one or more cracks make their appearance, unless, of course, the settling is absolutely uniform over the entire area. The best cement and toughest building stone and brick in a building are subjected to such strains that their tensile strength is but a secondary element. Briquettes of cement are tested for resistance to tensile strain, while the materials which the cement is to bind together are tested usually for compressive strength. But in the completed structure, if any irregular strain of sufficient intensity comes into existence, brick, stone and cement crack and break before a distortion of a fraction of an inch in extent is produced.

When constructors had presented for their use a material lead-like in its toughness, one which could be made to stretch and draw out of shape like iron in the blacksmith's forge, and which possessed also an enormous initial resistance to such deformation, a difficulty as old as their own art was removed. It is no wonder that within the last few years stone and brick have been given a semi-retirement, and that soft steel has been substituted for them in bridge work, and more recently in city buildings. The resistance of steel to all strains is enormously greater than is that of masonry, and if steel does yield to unforeseen strains, there is at least an impression that it will bend through a considerable arc before it will break. Engineers accordingly, perhaps over-appreciative of toughness and ductility, call for what is practically wrought iron in their specifications. The tall office buildings which have been and are being erected in the large cities of this country are made of this soft steel, as regards their frame. Their stone, brick or terra cotta fronts and walls are but sheathing; the building depends for its support upon a metallic frame.

No substance is more strikingly affected by the presence of small quantities of other elements combined with it than is iron. Without carbon it is ductile and malleable to a considerable extent, even when cold, and may be heated and suddenly or gradually cooled without any noticeable effect. But with a few tenths of a per cent of carbon combined with it, the material becomes far less ductile, and can, by heating followed by sudden cooling, be made brittle like glass. When the carbon reaches a proportion of two per cent the metal becomes cast iron, which is always brittle and rigid, and which by chilling from the fluid state becomes excessively hard and easily broken. Thus within the range of two per cent of carbon widely different products result.

The fashionable product for the use of the civil engineer of the day is virtually wrought iron, and now the impression is growing that too much faith has been placed in it. The tendency to use it is a species of reaction from the old days of brittle materials. Like many other reactions it has probably gone too far. The presence of carbon in iron does more than we have described above. It not only affects the resistance of iron to strains, but it affects its resistance to corrosion and oxidation. Soft iron acted on by the atmosphere in the presence of moisture oxidizes. The carbon dioxide of the air is probably an active element in the operation. Cast iron, on the other hand, resists oxidation almost like stone or brick. It is inferior in tensile strength to modern structural steel, and if it is subjected to a distorting strain it breaks before it bends to any extent. But it is strong enough for almost all purposes. No one supposes that the steel members of a building are to bend and twist, or even to be subjected to strains which cast iron would not perfectly resist.

This question has recently been presented to the architectural profession: Are we not going too far in using so corrodible a material as soft steel for the frame work of buildings?

A complaint or criticism which finds fault without the suggestion of a remedy is of little value. But this criticism, coming from one of the leading architects of the country, is not of this character. Our iron founders can supply cast iron which will be just as good for compression members as is steel, and which will never corrode. By bottom casting if necessary, and by rigid tests of each piece, cast iron cantilevers and columns of absolutely certain quality can be produced. The recent extensive introduction of steel castings indicates the practicability of supplying castings of comparatively low percentage of carbon, with enough carbon to make the material not corrosive, yet not so much as to make it too brittle.

It appears as if the recent rejection of cast iron as a building material has gone too far—already the signs of its new growth in favor are apparent. It would seem that in the production of special castings for tall buildings, castings of proper carbon percentage, and made by proper foundry processes, much valuable work could be done by our foundrymen and engineers. It cannot be considered an attractive practice to make the integrity of a twenty-storied building depend upon paint for protecting its frame from corrosion and ultimate destruction.

There is another point to be remembered. The integrity of a "steel cage" building frame depends on riveted joints. The rivets of these joints under strain may be expected to shear off long before the iron

beams and columns will permanently bend, so that riveted joints can be taken as introducing the breaking element into a structure made of the most ductile steel procurable. Meanwhile, if soft steel is used, it should be accessible for examination. Modern plumbing practice exposes all pipes for full access and inspection. Some similar system should be followed for the members of steel frames.

THE SNOWS OF MARS.

Among the most interesting observations of Mars during the recent opposition were those relating to the gradual disappearance of the snow cap surrounding its southern pole. The disappearance was due, of course, to the fact that it was summer in the southern hemisphere of Mars, and the polar snows melted more and more rapidly as the sun rose higher upon them. Yet, although the reason was plain, and because it was plain, one could not watch the process without experiencing a strange feeling that amounted almost to awe. It is quite easy to think dispassionately of the possibility that some things may go on in other worlds just as they do in this one as long as your eyes have not confirmed what is in your mind; but when, peering through a telescope, you actually behold such occurrences the effect is startling. It is like coming suddenly in broad daylight upon the scenery of a dream.

On the 1st of June the snow around the south pole of Mars was about 2,400 miles across. A snow cap of proportionate dimensions on the earth would, in the northern hemisphere, extend as far south as St. Petersburg, the southern point of Greenland, and Mount St. Elias, in Alaska. By the 1st of July the diameter of the snowy area had diminished to about 1,500 miles. On the 1st of August it was only 1,100 miles, and on the 31st of August, the date of the summer solstice in the southern hemisphere of Mars, the snow cap was but 500 miles across. But heat accumulates in a Martian summer after the sun has begun to decline, just as it does upon the earth, and accordingly the melting of the snows continued after the solstice was passed. At the end of September the diameter of the snow covered region was only about 350 miles, and at the opening of November it was less than 200 miles.

Now comes a curious fact. About the middle of October it was reported that the polar snow cap of Mars had vanished; some of the most powerful telescopes failed to reveal a trace of it! Yet it is not probable that it had actually entirely disappeared. The explanation of the apparent disappearance is no doubt to be found in the fact that as the snow area diminished it left the pole uncovered by receding to one side; for previous observations have shown that on Mars, as on the earth, what may be called the "pole of cold" does not correspond in location with the pole of the planet's axis. Schiaparelli's observations, in 1877 and 1879, showed that the center of the snow cap during its minimum in those years was displaced toward that side of the pole corresponding to an areographic longitude of about 40°. With the other side of the planet turned toward the earth the snow cap would have been invisible, being, so to speak, hidden behind the pole. This is apparently just what occurred in the middle of October last. The south pole was then free from ice and the center of the snowy region was displaced, as in 1877 and 1879, along the meridian of 40°. But it was the other side of the planet which was at that time presented toward the earth during the best hours for observation, and consequently no polar snow was seen; not because it had no existence, but because it was concealed.

It is probable, however, that at its minimum the snow cap was exceedingly small, perhaps less than 100 miles in diameter. No such rapid and extensive disappearance of snow and ice ever occurs upon the earth, although the advocates of an open polar sea may find encouragement in the fact that the uncovered south pole of Mars corresponds in color and general appearance with what are believed to be the water areas of that planet, while what remains of the snow cap in such circumstances rests, apparently, upon a mass of land, perhaps no more than an island, rising out of the polar ocean.

Owing to the larger eccentricity of its orbit, the extremes of temperature on Mars are greater than upon the earth, although the total amount of solar heat received by the planet is less than half as much as we get. But more important than these differences is the rarity of Mars' atmosphere, which has been so clearly demonstrated by the recent spectroscopic observations of Prof. Campbell. It may not be scientific, but it is certainly human to ask whether it is probable that beings resembling ourselves were included in the field of view of our telescopes last autumn, while we watched the southern snows of Mars sparkling to the sun and melting away at his ardent touch. If such beings are there, they must exist in an atmosphere less than one-quarter as extensive as the earth's.

GARRETT P. SERVISS.

THE harvester invented by McCormick in 1831 has been so improved that it is said it will cut and bind an acre of grain in forty-five minutes.

Motion of the Earth's Pole.

One of the most interesting questions in celestial mechanics was discussed at the recent meeting of the National Academy of Sciences at New Haven. It was the subject of a paper by Dr. S. C. Chandler, on the motion of the pole, which has been a special matter of investigation by the professor for several years. The observations thus far made, it is claimed, prove a latitude variation of 60 feet; that is, each parallel, instead of marking a fixed line on the earth's surface, indicates a line which shifts to this extent. From Lake of the Woods to Vancouver Island the forty-ninth parallel has been established as the boundary line between the United States and British America for a distance of more than 1,200 miles. Similarly the north line of New York, Vermont, and part of New Hampshire is the forty-fifth parallel for more than 250 miles. The shifting of these two boundary lines, consequently, brings alternately under the jurisdiction of the United States and Canada two strips of land 60 feet wide and 1,200 and 250 miles in length. Together they contain 11,000 acres, or enough land for one hundred good sized farms. This land was all on the Canadian side in April and May, 1890, and in May, 1891, and all on the United States side in November, 1890, and again in December, 1891.

The relative positions of the earth's pole of figure and pole of rotation, it appears, have been changing with respect to each other continually, and the course has, since 1890, been in an entwined oval spiral. This Dr. Chandler has platted, and has constructed a system of epicycles which he believes the two poles maintain with respect to each other. To put the algebraic expression in words is to say that there are two terms, one of which is an annual term, and is an elongated ellipse with a major axis of three-tenths of a second and a minor axis of eight-hundredths of a second, and the other term is a circle with a period of 428 days. These two motions superimposed give a curve, of which Dr. Chandler has made a diagram. The first three or four turns of the curve closely accord with the observations. In fact, as Dr. Chandler puts it, "theory gives latitude variations with greater accuracy than they can be determined by any individual series of observations." The curve has been continued according to the mathematic formula to the middle of 1895.

This movement of the pole is not to be confounded with the movements of precession and rotation which have long been known and carefully studied.

What is meant by the North Pole needs a little definition, for there are three north poles to the earth. One of these is the magnetic pole, where the compass needle points directly down. This was discovered and sailed over in 1831, and is situated in latitude 70, north of Hudson's Bay. Another is the geodetic pole, or pole of figure. On account of the flattening of the earth at the two frigid zones there are two points, one in each, which mark the ends of the shortest diameter of the globe, and these are the geodetic poles at the two ends of the axis of figure. The third is the astronomical pole, or pole of rotation. It has until recently been supposed to coincide with the pole of figure; but now it is known to be shifting, and the facts which Dr. Chandler has accumulated on this point afford about all the data of which we are thus far possessed.

When the variation in latitude was first suspected several years ago, two instruments were especially devised for its observation. They were made by Wanschaff, of Berlin. One of them was taken by Columbia College and the other by the Italian Royal Observatory of Capodimonte, near Naples. New York and Naples are in exactly the same latitude, and very nearly 90 degrees apart. They are, therefore, admirably situated to work together on this problem.

Through the liberality of President Low and others a special observatory was erected on the new college site at 116th Street and Amsterdam Avenue. Here observations have been conducted by Prof. John K. Rees, with the assistance of Dr. Harold Jacoby, Mr. J. T. Monell, and Mr. J. E. Davis. One or the other of these has been staying up and watching the stars every clear night since April, 1893. The plan of operation is such that very accurate results are obtained. Only stars which pass very near the zenith are observed.

The results of these observations, Prof. Rees says, will be worked out and announced in about three months. It is probable that the shape of the curve, as then determined, will, by its peculiarities, show what is causing it. At present, the causes are purely conjectural. Prof. Newcomb thinks that the shifting masses of ice and snow may be sufficient to cause it, and Prof. Scott, of Princeton, has suggested movements in the interior of the earth as the cause.

Dyed Chrysanthemums.

The practice of dyeing chrysanthemums to produce striking and unnatural color effects has become a very profitable part of the business of a fashionable florist. The pure white chrysanthemums are used for this purpose. They are colored by being submerged in different colored dyes and in many cases different colors are applied to different parts of the same flower. This work is usually done to order. If flowers are wanted to match the color of some particular dress or the drapery of a room, the customer generally brings to the florist a sample of the cloth to be matched. Chrysanthemums of any color of the rainbow can thus be prepared while you wait. Besides the plain colors, the flowers dyed half blue and half white and half orange and half black are very popular, and some curious combinations, such as the reproduction of a livid Scotch plaid, are much in demand. This singular practice is said to have grown out of the "necessity" of providing blue and white and orange and black chrysanthemums for New York's annual Thanksgiving football game.

Huge Hail Stones.

Prof. Cleveland Abbe includes the following among his notes in the Monthly Weather Review for July: On June 3 a tornado passed northeastward through the counties of Harney, Grant, and Union, in eastern Oregon. The most novel feature attending the disturbance was the hail. It is stated that the formation was more in the nature of sheets of ice than simple hailstones. The sheets of ice averaged three to four inches square, and from three-fourths of an inch to one and a half inches in thickness. They had a smooth surface, and in falling gave the impression of a vast field or sheet of ice suspended in the atmosphere, and suddenly broken into fragments about the size of the palm of the hand. During the progress of the tornado at Long Creek a piano was taken up and carried about a hundred yards.

The Fauvel Process of Treating Gold Ores.

A new method for separating gold from its ores has recently been introduced in the mining districts of Wyoming. The crushed ore is heated to a state of incandescence and quenched in a bath of cold water. As each red hot particle falls into the water, enough steam is instantly generated to shatter it, and any glaze or film is therefore ruptured. The particles of gold are thus broken down to a remarkably fine state and are rendered very brittle. The gold is clean and shining and quite free from any coating of oxide. This method makes it unnecessary to crush the ore very finely, and in addition the output of the mine is greatly increased.

Extensive Marble Belt in Georgia.

The State Geologist of Georgia reports that a belt of marble, 60 or more miles in length, has been discovered in the northern part of the State. Some of the marble, it is said, is of a flesh color tinged with green and some is a light gray banded with black. It can be obtained in large sound blocks, and is susceptible of a high polish. The report, however, suggests that on account of the mountainous character of the region in which it lies it will be costly to quarry it. If the reports be well grounded, however, there will doubtless be plenty of capital and labor forthcoming to quarry it. Many of the newspapers of Georgia are confident that it will bring great wealth to the State.

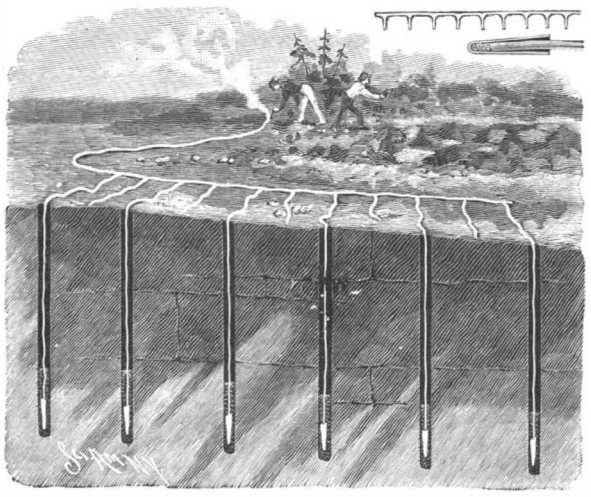
A State Park in the Catskill Mountains.

The New York State Forest Commission has recently made provision for a State park of some 30,000 acres in the heart of the Catskill Mountains. It will be situated in a very beautiful region in the vicinity of Slide Mountain, the highest peak of the entire Catskill range. This is a very populous region and may readily be reached by the local railroad. The announcement will doubtless be received with great pleasure by the many thousands who make this region their summer home.

A MULTIPLE BLASTING FUSE.

This is a safety fuse having a series of branch fuses and a waterproof blasting cap for each fuse, the arrangement being such that all may be discharged by lighting a common fuse, when the several caps will be exploded in the desired succession, any required number of charges being thus set off. The improvement has been patented by Mr. William C. Doyle, 216 West Hallam Street, Aspen, Col.

The main fuse is of common construction, and the branch fuses may be of different lengths and

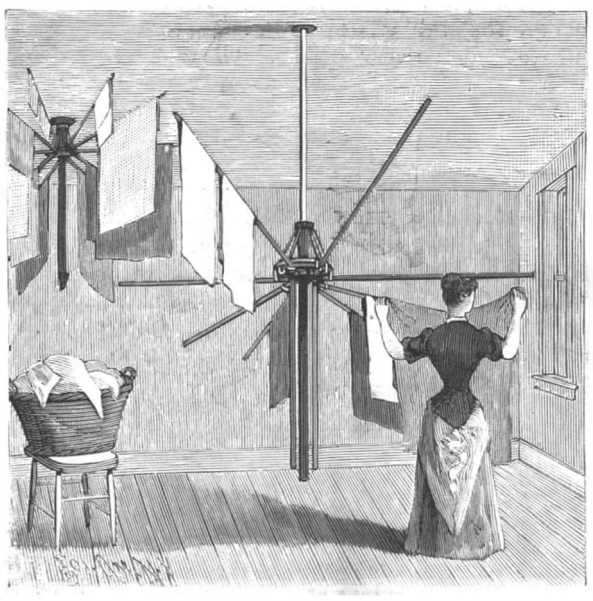


DOYLE'S MULTIPLE BLASTING FUSE.

lead from opposite sides, being plaited or otherwise joined to the main fuse, and fine black powder being used at this point to make it certain that every branch fuse will be ignited. Where the branch fuse terminates in the blasting cap, as shown in the small view, it is held in place by glue, rendering it waterproof. It is designed to manufacture these fuses in fifty-foot coils, with branches every four or five inches, so that those using them may cut off any number they want, there being less liability to waste by leaving over odd ones when the bunches are made so large.

AN IMPROVED CLOTHES DRIER.

This clothes drier is designed to be hung from the ceiling of a room and lowered as required for convenience in placing the clothes thereon, it then being raised out of the way in the upper portion of the room where the air is warmest. The improvement has been patented by Mr. James Reilly, of Calgary, Canada. The supporting spindle, adapted for attachment to any overhead support, is preferably of metal, and has at its lower end a recess in which is pivoted a catch. Over this spindle is passed a tube, expanded at the top, and carrying a horizontal partition or table having on its periphery metal loops or keepers for clothes-carrying arms in rod form. These arms when not in use hang perpendicularly around the tube, with which their inner ends are pivotally connected. When the wet clothes are to be placed on the drier, the body drops down to the proper position, on pushing in the catch, when the arms are carried to a horizontal position, one by one, and each engaged by a keeper, the operator thus working around the entire device until all the clothes have been placed, when it is pushed



REILLY'S "OUT OF THE WAY" CLOTHES DRIER.

upward to its upper position. The apparatus may also be applied to a stand upon the floor, or the spindle may be attached to the floor, and the body slid upward, thus utilizing all available space for drying.

EXCLUDING about 62,000 small craft, it is said, the commerce of the world is carried on by 45,000 vessels of 20,500,000 registered tons.

Ferdinand de Lesseps.

Count Ferdinand de Lesseps, engineer of the Suez and Panama Canals, passed away at the Chateau la Chesnaye on the afternoon of December 8. De Lesseps' last years were clouded by the Panama scandals and he died a disappointed, heart-broken man, almost in poverty. He was born at Versailles, France, in 1805. He was descended from a noble family and was educated for the diplomatic service. He occupied various positions in the East, and in 1838, when he was appointed consul to Rotterdam, he began the study of canals, which was to be his life work. In 1854 his plan of piercing the Isthmus of Suez began to take shape. He was warmly seconded in his designs by the Empress Eugenie, and in a few years a large fund was raised to prosecute the work, which was actually begun in 1859.

In November, 1869, the canal was opened to the commerce of the world by the Empress Eugenie. The brilliant success of this undertaking led to the establishment of the ill-fated "La Compagnie Universelle du Canal Interoceanique de Panama." At this time De Lesseps was hardly possessed of the powers of his younger days, so that unscrupulous men were allowed to fill the important executive offices in the company. The administration of this vast company was rotten to the core, and De Lesseps was overwhelmed in the crash which followed, a crash which shook France to the very foundations and left the illustrious engineer, who had been a mere figurehead, a physical and mental wreck.

There is hardly a more pathetic incident in the history of the nineteenth century than the old man who was once the glory of France, and who was called "the great Frenchman," sitting with bowed head in the Chateau of La Chesnaye, while in Paris he was being tried for alleged crimes. He was convicted, though he never knew of it, and was sentenced to fine and imprisonment, but to the credit of the French nation the sentence was not carried out, for once the hand of justice was suspended by an overwhelming wave of popular opinion. The career of this man was without a parallel, and Vicompte Ferdinand de Lesseps has passed into history as one of the most picturesque and romantic figures of modern times.

An Exhibition of Photo-mechanical Work.

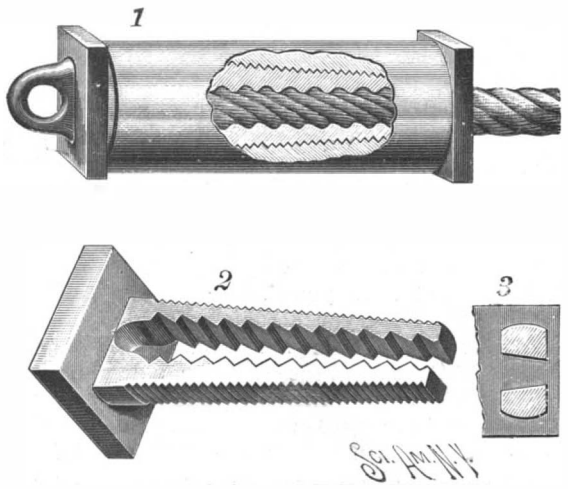
The Society of Amateur Photographers, of New York, announces that a free exhibition of photo-mechanical prints and printing processes is to be held at the rooms of the Society of Amateur Photographers, of New York, 111–115 West 38th Street, from December 3 to December 15. Besides a large collection of foreign work collected by the European agent of the society, all the leading photo-mechanical printers of this country will exhibit specimens of their best work. A feature of the exhibition will be the large display of prints in colors, a process which is now engaging the attention of many photo-mechanical printers. During the exhibition lectures and demonstrations will be given by Prof. Chandler, of Columbia College; Fred. E. Ives, of Philadelphia; Mr. Koehler, of the Smithsonian Institution; Mr. Ernest Edwards, Mr. Walter E. Woodbury, and others.

AN IMPROVED FEED WATER HEATER.

The illustration represents a feed water heater which also removes grease, oil, etc., entering with the feed. It is adapted for use on all kinds of steam boilers, obviating the necessity for using chemicals, and preventing internal corrosion and pitting of the tubes. The improvement has been patented by Mr. G. M. Mullen, 106 South G Street, Baltimore, Md. The heater, B, has a water space with end inlet and outlet chambers, as shown in Fig. 2, tubes connecting the chambers, and there being a surrounding steam and water space. The supply pipe, C, from the pump, leads into the inlet chamber, and a pipe, D, leads from the outlet chamber to a water leg of the boiler, this pipe having a check valve, G, to prevent back pressure. A surface blow pipe, A, leads from the boiler to the top of the heater, a valve regulating the passage of steam through this pipe. A pipe connects the heater near its bottom with the supply pipe, a check valve, E, in this pipe, permitting steam and water from the boiler under excessive pressure to pass into the supply pipe, and yet preventing the feed water from passing into this pipe. From the latter pipe, a pipe, F, leads overboard or to the condenser. A small amount of extra feed is kept on to make up the loss from blowing, and this is more than compensated for by the additional heat imparted to the feed water. The inventor has employed these heaters for more than a year with boilers using surface condensers on his own towboats, and has found them of great advantage.

AN IMPROVED ROPE CLAMP.

The device shown in the illustration was primarily designed for connecting the wheel rope to the steering rod aboard vessels, for which purpose it has been a long time employed by the inventor. It is preferably made of brass, and may also be employed to secure the ends of clothes lines to hooks, and for a variety of similar uses. It has been patented by Mr. G. M. Mullen, 106 South G Street, Baltimore, Md. Fig. 1 is a view in perspective, partly broken away, of the device as applied, Fig. 2 showing the clamp section and Fig. 3 a cross section centrally of the latter. On



MULLEN'S ROPE CLAMP.

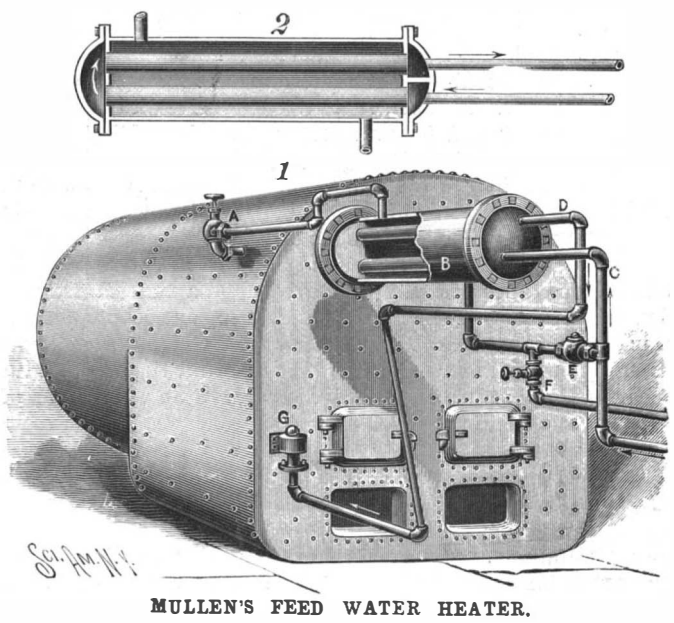
the outer side of the head of the clamp section is an eye, to facilitate its connection or attachment when desired, and the clamping jaws have tapering threaded edges upon which a case section is screwed to press the jaws together and clamp the rope between them. From the manner in which the jaws are set the rope may be inserted laterally, so that a very efficient clamping may be effected with but a slight compression.

Canal Traction in Europe.

In a paper on boat traction on canals, presented to the Paris Academie des Sciences, M. Maurice Levy states that the cable system has given excellent results in an experimental installation tried on a three mile length of canal in the suburbs of Paris. A somewhat similar plant, erected by the German government on the Oder and Spree Canal, has been less successful. The winding engines should, M. Levy states, be placed twenty-five miles apart when the traffic is 1,000,000 tons per annum; for 2,000,000 tons they should be placed at about twenty miles apart; for 3,000,000 tons at about sixteen and a half miles apart; and for 4,000,000 tons at about fourteen miles apart. The system is not economical for a traffic smaller than 1,200,000 tons per annum. The first cost of the system is about $8,000 per mile.

Providing Anti-Toxine for New York.

The health authorities of Paris have found that the death rate from diphtheria has recently been reduced ten per cent by the use of anti-toxine. The contrast between this report and that of the Board of Health of New York for last week is very significant. There were fifty-four deaths from diphtheria in New York, an increase of fourteen over the previous week. The bacteriological department, however, is busy collecting



MULLEN'S FEED WATER HEATER.

germs for the infection of animals. Some twelve or fifteen horses have been inoculated, and it is expected that by the first of the year there will be a plentiful supply of anti-toxine ready for use. In the meantime, however, Dr. Biggs of the Board of Health will purchase $1,000 worth of the drug from Europe. The purchase will consist of 130 vials of the first, second and third grades of virus. The result of this measure will be watched with great interest.

TRAVELING MILITARY TURRETS.

We have many times already pointed out to our readers the importance of the role of protected turrets in the work of the defense of strong places. It seems advisable now to make known to them an application of the properties of these metallic apparatus in the operations of the field of battle. We intend to speak of the "movable protected gun carriage" or "trench armoring," constructed at the Gruson works in Germany under the instructions of Major Schumann. It is said that an analogous system is perhaps to be studied in France also, and we are able to give a description of the apparatus such as they are now conceived. The idea, however, is certainly not new. Campaign turrets moved about on carts were in use in Persia in the remotest antiquity. Those that Cyrus had at the battle of Thymbra were about fifteen feet in length. Placed upon a platform drawn by eight yoke of oxen, each of them, says Xenophon (Cyropœdia, Lib. XI.), was occupied by a detachment of twenty picked archers.

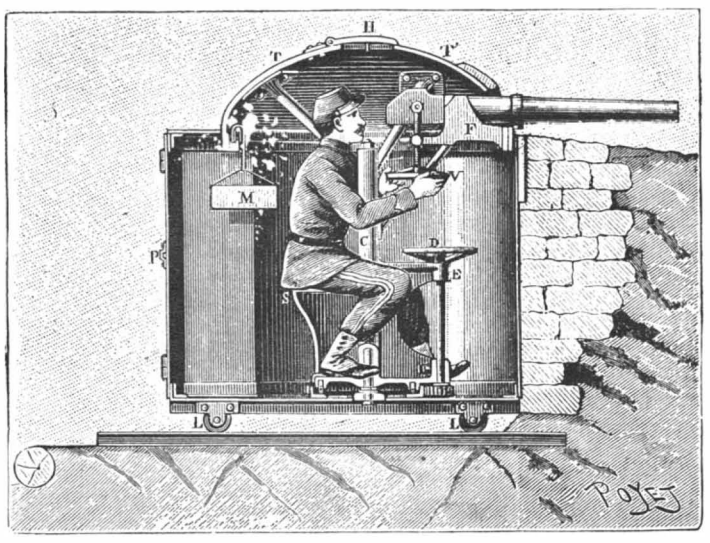


Fig. 1.—CAMPAIGN TURRET IN POSITION UPON THE TERREPLEIN OF TEMPORARY FORTIFICATION.

The ancients also made use of campaign turrets mounted upon the backs of elephants. These wooden works, fixed to the pack saddles of the great pachydermatous motors, were bordered with parapets covered with the hides of recently skinned oxen. But passing rapidly to modern times, let us see what there is in the economy of the Grusonwerk products. The Schumann campaign turret consists of an iron plate cylinder about four feet in internal diameter provided with a door, P, and closed at its base by a metallic floor and at its top by a convex cupola ten inches in thickness (Fig. 1). At its upper part the cylinder is strengthened by a ten inch thick forged iron ring. The roof, which is essentially movable, rests through the intermedium of three supporting branches upon a central column, C, whose lower extremity, in the form of a pivot, is capable of revolving in a step bearing fixed to the floor, and the circumference of which is toothed.

Under the cupola there is in battery a 1½ or 2 inch rapid fire gun served by two men, one of whom has charge of the ammunition, while the other, upon order, does the loading, pointing and firing.

The cheeks, F, in which rest the trunnions of the gun, are invariably connected with the roof, so that the recoil is completely suppressed. At the moment that the piece is fired, the cupola oscillates slightly, but, owing to the position occupied by the center of gravity, it immediately rights itself. The man charged with the maneuvering remains seated upon the chair, S. He points through the gun port formed in the cupola, and then, after the port has been secured against the danger of a reply by the enemy through a revolution of 180 degrees, he can survey the field through a sight hole, H, provided with a shutter.

In order to point in direction, the gunner causes the cupola to revolve by maneuvering the hand wheel, D, upon the axis of which is mounted a pinion that engages with the teeth of the step bearing. This axis, which traverses the arms, E and G, keyed upon the column, C, can be rendered immovable when occasion requires it.

The apparatus for upward pointing consists simply of a screw that the seated gunner maneuvers by means of the hand wheel, V. The amplitude of the angle of firing may be varied by ten degrees above to five degrees below the horizon. In the interior of the cylindrical turret there are ammunition chests, M, suspended from a circular rail along which they can be made to slide. The gunner brings them within his reach in measure as the exigencies of the firing require it. As soon as one of the chests is empty he unhooks it and passes it to the assistant, who replaces it by a full chest.

The cartridges used are metallic. The charge of powder is inclosed in a brass cylinder fixed to the base of the projectile. The supply is 160 shots for the 1½ inch caliber and 130 for the 2 inch. The turret that has just been briefly described is essentially transportable. To this effect, it is mounted upon a two-wheeled vehicle of special construction, drawn by six horses (Figs. 2 and 3).

The axle is bent twice at right angles so as to diminish the height of the carriage. To this axle and to the frame of the vehicle are fixed two rails about six feet in length upon which the turret rests through the intermedium of four wheels, L L (Figs. 1 and 2).

From the carriage are suspended two other lengths of rail that are laid upon the ground in the prolongation of the others at the spot that the turret is to occupy after being removed from its carriage. Upon reaching its destination, the turret is set into the earthwork of the parapet that it is to arm. There then emerges from this earthwork nothing but the cupola of the turret and the chase of the gun (Fig. 4), ready to fire from 30 to 40 shots a minute. In default of receptacles prepared in advance, the turrets may be placed against the interior talus of the parapet. The cupola is proof against balls and fragments of shells, but not against direct shots; yet, since it offers to the enemy's artillery a target of but limited dimensions, it runs little risk of being struck directly. It is estimated, moreover, that it would suffice to give the steel cupola, TT, a thickness of 1¼ inches, and the forged iron ring, A, 2 inches in order to have the armor resist the action of campaign shells perfectly.

The weight of the turret, inclusive of the gun, is 3,300 lb. for the 1½ inch caliber and 4,400 for the 2 inch. As the vehicles weigh respectively 1,188 and 1,520 lb., the total weights to be considered are 4,488 and 5,920 lb.

It will be understood that the putting in battery of a campaign turret requires the combined efforts of quite a large number of men, and that the performance of this operation takes a certain amount of time. Apropos of this, it is well to observe that it is possible, in case of need, to work the turret without dismounting it from its carriage.

The German General Von Sauer, in accord with Majors Schumann and Scheibert, estimates that the use of campaign turrets may, in certain cases, exert a decisive action upon the operations of war. Such was not, it must be said, the opinion of Marshal Moltke, who treated these movable armorings as playthings, as masterpieces of clockwork that almost anything puts out of order and that cannot be made use f for any length of time. But the marshal is no longer of this world, and, consequently, the authority of his opinion has lost somewhat of the prestige of yore. The Germans think that it is expedient to have recourse to the use of these "movable protected gun carriages," as they call them, for improvising centers of resistance designed to serve as supporting points for bodies of troops in action; and that, too, not only upon a field of battle properly so called, but also in the zone of the defensive positions of a stronghold.

In this order of ideas they ar making studies of turrets capable of receiving rapid fire guns of a caliber greater than that of those put in service up to the present, and have already submitted to experiment a type of protective armor for a 2¼ inch gun. Our government cannot delay following them in this direction, and so we have put French uniforms upon the persons who give life to our explanatory figures.

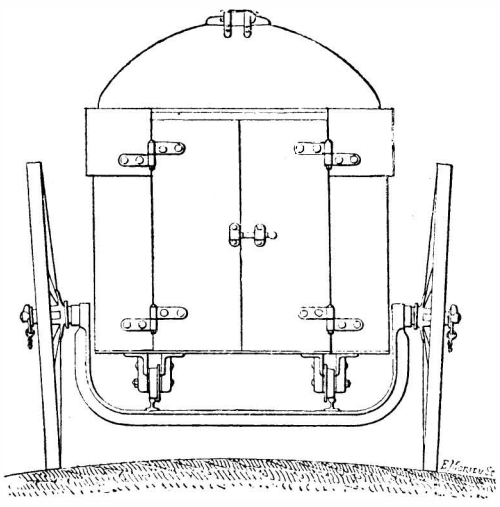


Fig. 2.—THE TURRET MOUNTED UPON ITS CARRIAGE.

We have stated above that six horses must be harnessed to the carriage of the turret designed for the reception of 1½ and 2 inch rapid fire guns. Now the increase in caliber and in the thickness of the armor will necessarily correspond to an increase of the total weight of the apparatus. How can a load be moved that could not be pulled by six collars together? The solution of the problem seems to be plainly indicated. It is necessary to have recourse to som mode of traction without horses, and, in this regard, to make an appeal to the ingenuity of the laureates of the competition recently opened by the Petit Journal.—La Nature.

Fig. 3.—CAMPAIGN TURRET, WITH ITS DRAUGHT HORSES.

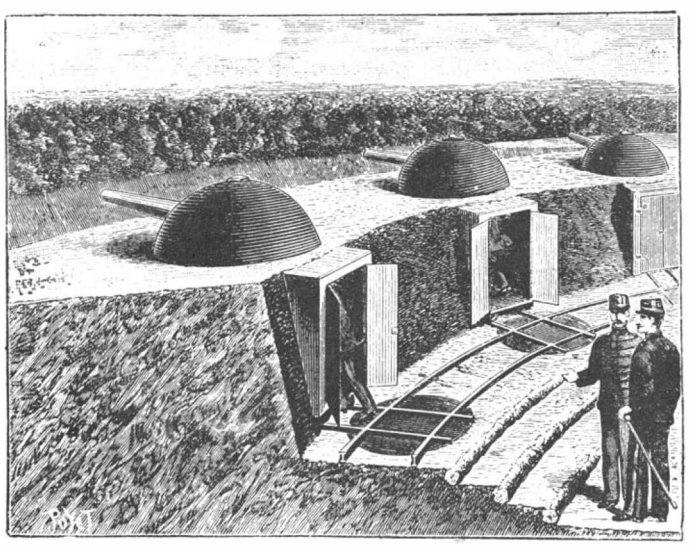


Fig. 4.—GROUP OF TURRETS IN POSITION IN THE EARTHWORK OF THE PARAPET OF A TEMPORARY FORTIFICATION.

Light from Water Power.

An American traveler in the Tyrol and other Alpine countries gives an interesting account of the manner in which the Alpine torrents are being utilized in the Swiss villages. Until the past year these villages were lighted at night only by an occasional swinging horn lantern. Now the streets in many cases are as brilliantly lighted as Broadway. There are clusters of incandescent lights strung across the streets every few yards. The little inns and the scattered shops are also lighted up brightly inside and out. The same change is spreading everywhere. It is probable that extensive manufacturing interests will soon spring up and the mountain torrents will turn saws and spindles as well as dynamos. There is the greatest abundance of power going to waste on every side which may easily be made to run machinery.

IT takes a snail exactly fourteen days and five hours to travel a mile.

The Atmosphere of Mars.

Though the evidence is as yet insufficient to prove the existence of cloud or mist on Mars, of water vapor as such present in his atmosphere there is practically no doubt whatever. It is through the air that the water liberated every year from about the pole must return to form the next winter's snows. Furthermore, the spectroscope has been thought to show the lines of water vapor in the spectrum of Mars, but the observation is of extreme faintness and the result proportionately doubtful. But another argument from the behavior of the polar snows can be drawn with some cogency. From the manner and extent of their melting, the climate of Mars seems peculiarly mild, whereas the thin air and the distance of the planet from the sun would necessitate an unpleasantly frigid one, something almost perpetually below the freezing point. Now, as Flammarion points out, the presence of sufficient water vapor in the air would suffice to produce the observed convenient amelioration.

To sum up, then, our present knowledge of the atmosphere of Mars, we may say that we have proof of its existence and reason to believe that it is at the surface of the planet about half as thin as ours is on the summits of the Himalayas; that in constitution it is probably similar to our own, except that it is more heavily charged with water vapor; that it is nearly, if not quite cloudless, and that rain or snow are almost unknown phenomena on Mars, dew or hoar frost ill supplying their place. For precipitation would be actually too precipitate for anything else. Finally that in the day time, at least, it is almost perpetually fine weather on Mars.

One deduction from the extreme rarity of the air we must, however, be careful not to make: that because it is thin, it is incapable of supporting intelligent life. That beings physically constituted like us could not exist there with any comfort to themselves is more than likely. But lungs are not inseparably linked to logical powers, as we are sometimes shown in other ways, and there is nothing in the world or beyond it that we know of to hint that a being with gills might not be a superior person notwithstanding. Doubtless a fish who had had no experience of man would conclude life out of water to be impossible. In the same way to argue intelligent life beyond the pale of possibility because of less air to breathe than that to which we are, locally, accustomed is, as Flammarion happily puts it, to argue not as a philosopher, but as a fish.—Percival Lowell in Popular Astronomy.

The Law of Invention.*

BY HORACE PETTIT.

Where a mere doubt exists at the time of application regarding the novelty and patentability of an invention, it is generally resolved, as it should be, in favor of the applicant, and the courts, when subsequently called upon to pass upon such patent, will, as they should, be considerably guided, where such a doubt as to patentability still exists, by the fact that the invention in question has proved commercially successful.

As a usual rule, however, in the class of cases just referred to, it will be found that where an invention has proved successful commercially, there is some inherent reason for it residing in the invention itself. This may be illustrated, for instance, by the celebrated telephone cases, where a mass of alleged anticipatory testimony, some of it very strong, was produced. It is true that the credibility of some of the testimony was very much doubted by the court, but Mr. Bell had in his favor throughout the whole proceedings the fact that he had described a successful operative means of transferring to, or impressing upon, an undulatory current of electricity, the vibration of air produced by the human voice in articulate speech, in such a way that the speech was carried to and received by a listener at a distance on the line of the current. Never before had such an invention been given to the public. It was one of the greatest inventions of the age, and naturally it would have taken very strong evidence of anticipation to have defeated his patent. (American Bell telephone cases, 126 U. S., 863.)

The Bell company rested its entire case upon the fifth claim of the Bell patent, which is as follows: "The method of, and apparatus for transmitting vocal or other sounds telegraphically, as herein described, by causing electrical undulations similar in form to the vibrations of the air accompanying the said vocal or other sounds, substantially as set forth."

It is interesting to note that when Bell applied for his patent he had never actually transmitted telegraphically spoken words so that they could be distinctly heard and understood at the receiving end of his line; but, as stated by Mr. Chief Justice Waite, in delivering the opinion of the court: "In his specification he did describe accurately, and with admirable clearness, his process; that is to say, the exact electrical condition that must be created to accomplish his purpose; and he also described with sufficient precision to enable one of ordinary skill in such matters to make it, a form of apparatus which, if used in the way pointed out, would produce the required effect, receive the words, and carry them to and deliver them at the appointed place. The particular instrument which he had and which he used in his experiments did not, under the circumstances in which it was tried, reproduce the words spoken so that they could clearly be understood; but the proof is abundant, and of the most convincing character, that other instruments, carefully constructed and made exactly in accordance with the specification, without any additions whatever, have operated and will operate successfully."

It will thus be seen that although Bell did not give to the public at the date of his application for a patent a commercially operative device, and never up to that time had constructed one himself, he did, nevertheless, describe and claim such a device in his application as would enable others skilled in the art to make a successful operative commercial device. Perhaps it may be safely said that at the date of Bell's application he had not been as successful in his actua- experiments as some of those who had experimented before him, but they had never completed, either in an actual device, or upon paper, the invention to the extent to which Bell had perfected it.

Mr. Chief Justice Waite said inter alia: "Some witnesses have testified that they were unable to do it (construct an apparatus from Bell's patent); this shows that they, with the particular apparatus which they had, and the skill they employed in its use, were not successful, not that others, with another apparatus, perhaps more carefully constructed, or more skillfully applied, would necessarily fail. As was said in Webster Loom Company vs. Higgins (105 U. S., 580, 586), 'when the question is whether a thing can be done or not, it is always easy to find persons ready to show how not to do;' if one succeeds that is enough, no matter how many others fail. . . . The law does not require that a discoverer or inventor, in order to get a patent for a process, must have succeeded in bringing his art to the highest degree of perfection. It is enough if he describes his method with sufficient clearness and precision to enable those skilled in the matter to understand what the process is, and if he points out some practicable way to put it into operation. This Bell did."

* Abstract of lecture delivered before the Franklin Institute, Philadelphia.

Arc Lamps in Cotton Mills.

The use of arc lamps in cotton mills, upon what is known as the "inverted arc system" of lighting, is slowly but surely making headway in England, according to the London Electrical Review. Owing to the murky atmosphere which prevails in English manufacturing districts, where cotton mills most do congregate and where the sun is rarely seen, there is need for artificial light during greater portion of the working hours, hence the question of lighting is a very important one, not only for mill owners, but also for mill hands. Gas at its best is a poor substitute for daylight, and is further objectionable on sanitary grounds. The advent of incandescent electric lighting was a great improvement, no doubt, both as regards safety and health, but it still left much to be desired as a light for mill purposes. Arc lighting, as then known, was found unsuitable on account of the hard shadows cast, and furthermore was regarded as unsafe, and consequently practically prohibited by the fire offices.

The first attempt at mill lighting by arc lamps upon a rational system emanated, if we mistake not, in France. This simply consisted in suspending an inverted cone reflector below the arc, thus throwing the light first upon the whitened ceiling above, and thence upon the work below. By thus doubly reflecting the light, and at the same time shielding the eye from the direct rays, the effect was most pleasing, the perfect diffusion thus attained practically destroying all shadow. The next advance was to invert the arc itself by placing the crater carbon below, and in this form we have what is known as the "inverted arc" system of lighting. So much is the new light appreciated—rivaling daylight itself—that mill owners readily pay the extra tax imposed by the fire offices rather than be without it. At the same time it must be admitted that great care is needed when introducing arc lamps in the presence of such highly inflammable material as cotton, and upon this score we venture to offer a few remarks.

There are two cases on record of serious fires in cotton mills traceable to arc lighting. In the first case the usual netted glass globe had alone been relied upon for protection, and owing to some imperfect construction, or, what is more likely, the neglect of the trimmer to replace an injured globe, a particle of heated carbon escaped from the lamp on to the material below, immediately setting fire to the cotton, and resulting in the destruction of the mill. The second case was in connection with the use of an inverted cone reflector suspended below the arc by means of chains, made detachable to admit of trimming. The lamp had just been retrimmed, when the cone reflector was seen to tilt violently on one side, dislodging a large particle of the crater carbon onto the mule beneath, setting fire to the cotton, with the same disastrous result to the mill as in the case above quoted.

Here again the trimmer either failed to properly reconnect the chain, or else some part of the suspension gear gave way. Now there is a lesson to be learned from these two fires. It is evident that glass, or any other such brittle material, should not alone be relied upon as a guard against the escape of heated material from the arc. The necessity for retrimming every six or eight hours during the running of the mill, and frequently under trying circumstances, leads to breakages, which are not always attended to in time; and t he bungling or neglect of the trimmer is the one factor most to be feared, as well as the most difficult to provide for. Glass of any kind is therefore better dispensed with. It absorbs much light, particularly when coated with dust, and casts unpleasant shadows.

The supposition that there is danger in a naked arc burning in an atmosphere charged with fine cotton flyings has been proved groundless, and experiments also show that the dust which collects within the reflector is impotent to do harm. In fact, it appears that the one and only danger to be apprehended is the possibility of a considerable particle of the incandescent carbon coming in contact with the material itself. We believe it possible to give all the protection necessary by a well designed and ample metal inverted cone reflector, without the addition of a globe, provided it be permanently and rigidly attached to the body of the lamp. Indeed, it should be a sine qua non in all arc lamps for cotton mill lighting that no essential guard or any part of the suspension gear needs detaching for purposes of adjusting or renewing carbons.

Next in importance is the suspension gear, for should a lamp fall when in use the result would probably be fatal. Usually the lamp is suspended by a cord or chain, with counterweights, over a couple of small pulley wheels, with considerable wear and tear upon the cord. This, therefore, should be strong, preferably of steel, with well made connections; and as an additional precaution, an independent guard chain is recommended to prevent the lamp falling beyond a certain distance in the event of any portion of the suspension gear giving way.

The use of arc lamps in the spinning and carding rooms of cotton and flax mills must always be attended with more or less danger, and only by carefully attending to such details of construction as we have here briefly alluded to can that danger be reduced to a minimum.

The Transit of Mercury, November 9-10, 1894, as seen at the Lick Observatory.

BY E. E. BARNARD.

A more superb day than Saturday, November 10, could not have happened for the transit of Mercury. Though a slight northerly wind was blowing, it did not materially affect the observations. The air was warm and balmy and was unusually steady for a Mount Hamilton day.

My observations of the transit were confined to the 12-inch, with which all four contacts were observed. and fifty-three independent measures of the right ascension and declination diameters made. Forty-eight measures of the position f Mercury on the sun's disk were also obtained.

The unusually good conditions prevailing gave an opportunity to look for evidences of an atmosphere to Mercury and for any unequal shading of his disk.

Neither at contacts nor while on the sun's disk could any luminous ring be detected. The disk was uniformly dark, round and sharply defined during the intervals of best seeing.

The white spot reported at some previous transits as having been seen on the disk of Mercury was not visible, and has doubtless been an optical phenomenon, unless it was turned away from us at these observations.

It was noticeable that the disk of Mercury was not black—it seemed to be lighter than the sky about the sun. A micrometer wire placed over the planet was apparently more in contrast than when against the sky outside the sun's disk. The wire seemed to be about twice as black as Mercury, while on the sky there was but little contrast. This illumination of the disk could scarcely have been due to earth light, and I therefore assume that it must have been purely optical.

An attempt was made to see the planet before its entrance onto the sun, but nothing could be seen of it. Nor was that portion of it visible which was not yet on the sun, during the interval between first and second contacts.

At the first internal contact the black drop formed but the geometrical contact could be easily decided. This black drop—which was only slight—lasted for about nine seconds after contact.

There was no black drop at the internal contact going off—definition then being excellent.

In the first half of the observations six inches aperture was used. This was reduced to five inches toward the last, as the heat became so great as to crack the sun cap.—Popular Astronomy.

THE WAR SHIP ATLANTA AND HER MAGAZINE.

Few ships of the new navy have received more attention than has been given to the cruiser Atlanta, which occupies an interesting position on account of having been among the earliest of the ships which could properly be designated as belonging to the navy of to-day. The construction of the Atlanta and the Boston was authorized in 1883, and the contract was signed during the same year. By statute she was to be a ship of about 3,000 tons displacement and was to be of the cruiser type. The Atlanta's armament includes two 8 inch breech loading rifles, one mounted in a barbette forward and another in a barbette aft, the barbettes being set, one to port and the other to starboard of the median line of the ship. Her midships is occupied by a superstructure, behind which are placed six 6 inch breech loading rifles, four in broadside, one forward and one aft. The upper illustration shows the deck of the superstructure. It will be understood that the main battery is all situated below this deck. Her secondary battery includes two 6-pounders, two 3-pounders and two 1-pounder rapid firing guns, and six smaller pieces. Our lower illustration shows the scene in the magazine with the ammunition hoisting apparatus at work raising the cartridges in their cases to the deck, while on each side are seen the shelves on which the cartridges are arranged.

Going back to the period of her construction, it is interesting to note the difficulties experienced in those days in completing a ship of war. Large steel castings were not then available, so that her stem and stern posts were forgings made from scrap or bloom, and only a few of the smaller of the moving parts of the machinery were made of cast steel. Her shaft was not made of steel, but of wrought iron with steel pins. The Dolphin, built about the same time, was provided with a steel shaft, provision for which was made in the contracts of the Atlanta, Boston, and Chicago, as well as the Dolphin. The Advisory Board, however, condemned the Dolphin's shaft, and on the responsibility of the contractor it was put in place, only to break upon her trial trip. The contractor thereupon suggested that the contracts be modified, and in the specifications of the four ships "iron" was substituted for "steel" in the construction of the shafts.

An interesting comparison between the Constitution, built in 1797, and the Atlanta, built in 1883, has been made by Lieut. J. F. Meigs of the United States Navy. The Constitution's armament of 24 and 32 pounders, with a total of fifty-four guns, delivered at a discharge 684 pounds of projectiles, while the Atlanta, with her eight guns, can discharge 800 pounds. The Constitution's water-line thickness was about 22 inches of oak, penetrable by guns as good as her own at about 1,000 yards range. The Atlanta's 6 inch guns, on the other hand, at 1,000 yards range, can penetrate a thickness of twenty times that of her side at the water line, which is but ⅝ of an inch. This plate of steel is supposed to have the resisting power of the 22 inches of oak of the Constitution, and as Lieut Meigs puts it, "while the defensive power at the water line remains about the same, the later ship has a battery power which, considered with reference to penetration alone, is twenty-five times stronger, roughly." The guns of the Atlanta can penetrate a ship similar to herself, while still hull down on the horizon, if the gunner can but hit the enemy at that distance.

The duty of such a cruiser is to accompany and assist the battle ships, carry information and stores, and attack the enemy's commerce and convoy and guard our own. It is now some seven years since the Atlanta was taken to Gardiner's Bay, Long Island, to have her battery tested. As a result, both the 8 inch gun carriages were disabled and the other gun carriages proved unable to stand the strain put upon them, and the ship herself was shaken up considerably by the explosions. In those days the finer points about gun carriages were not well understood, and the importance of having some elastic material between the gun carriage and the holding-down plates was not realized. In resisting the recoil of a gun, work is done which practically consists of force exercised during a given time or over a given distance. The total work remaining the same, the greater the distance or the longer the time, the less will be the maximum force exerted by the recoil. At present, where gun carriages are bolted to a deck, unless the deck itself has a thick covering of wood, heavy oak planks are inserted between the washer plate under the deck and the deck proper. This provides the requisite elasticity for preventing the force from reaching so high an intensity as it does where the backward plunge of the gun is resisted by metal bearing directly against metal. To-day the Atlanta is a serviceable ship, and she has recently executed, with her ram, a service in the order of peace, by cutting in two a floating derelict, as illustrated in our issue of September 22, 1894.

PLATINUM has been drawn into smooth wire so fine that it could not be distinguished by the naked eye, even when stretched across a piece of white cardboard.

The Clover Mite in Houses.

The specimens accompanying the letter of your correspondent, L. A. G., looking not unlike minute reddish spiders, are a species of mite which has been called the clover mite (Bryobia pratensis, Garman) by virtue of the fact that it is perhaps more common upon clover than upon other plants, though it is found upon very many other kinds of vegetation. Your correspondent is correct in assuming that it is closely allied to the red spider, as it belongs to the same family, and was, indeed, for some time confounded with this last species. It has a wide distribution, occurring throughout the Northern and Central States from Massachusetts to California.

When the mite is abundant its injuries to the foliage of plants is manifest by their turning yellow and becoming seared very much, as in the similar injury from the red spider. The peculiarity in the habits of this mite, described by your correspondent, of entering houses has been experienced and recorded by many other correspondents. In autumn the mites seem to prefer to secrete themselves in the crevices of the trunks and twigs of trees, the latter of which they frequently cover with their rather bright red spherical eggs, which are often so numerous that they give the twigs and branches of the tree a decidedly reddish hue. The use of the kerosene emulsion is advised as a remedy to protect the plants attacked, and the same should be applied to all vegetation adjoining houses which are being invaded by the mites. Spraying with benzine is the best thing that can be recommended for ridding portions of houses of the mite. If precautions be taken against fire, the benzine may be used freely, and the unpleasant odor will soon disappear with thorough airing.

C. V. RILEY.

Japanese Oddities.

Japan, which already has its emancipated women, its politicians, its demagogues, and even its anarchists, has, says a writer in the Revue des Revues, nevertheless kept intact a host of oddities which, in a certain respect, are stranger still than those of the Celestial Empire. The following are some of them:

While we write from the left to the right, the Japanese write from right to left. In writing, we form horizontal lines, while the Japanese make perpendicular ones. A Japanese book begins where ours ends, and, consequently, when we read a book we turn the leaves from right to left; but the Japanese are forced to turn them from left to right. We make our references at the bottom of the page; the Japanese place them at the top.

The Japanese women are odder than their books. European women show their necks and arms, while a Japanese woman carefully covers the upper part of her body and shows only her feet. A Japanese female is richly clothed up to the age of sixteen or seventeen, but a French female does not begin to dress in style until after reaching this age.

A Japanese belle is a small, very slender woman lost in a large piece of fabric, which permits of a glimpse of nothing but a pair of wild eyes in deep orbits and a vague, indescribable smile. A fair complexion is repugnant to her, and plumpness frightens her. A Japanese Venus would provoke a smile from an Aryan, while a European Venus would doubtless be considered in Japan as a type of a vulgar woman.

Among us it is the chaste women who usually shine by their intelligence, but in Japan intelligence appears to be the appanage of women who lead a more or less frivolous life.

We wear black as a sign of mourning, while the Japanese wear white clothing under the same circumstances.

At our receptions, women always play the first role; they are served first and the best places are assigned to them. In Japan, things are entirely otherwise. The women remain standing while the men are eating. This ceremonial does not apply at soirees, for the simple reason that women in this case are conspicuous by their absence. Woman is the inevitable ornament at our fetes, but in Japan she is treated as an obstacle that works injury to the splendor of the occasion. So woman is dispensed with, to the great satisfaction of all present.

We eat around tables of some size, but the Japanese are served at small tables placed near the wall, and which afford hospitality to but one person. Our servants hand the dishes to us from behind; in Japan they are presented from the front.

We always put the prenomen before the family name, while the Japanese do just the contrary.

We carry children in the arms; Japanese women carry them on the back.

In meeting a person, we turn to the right; but the Japanese turn to the left.

With us, women of different social classes are somewhat distinguished by their toilet; but in Japan every woman, beginning with the wife of the Mikado and ending with the simple workwoman, wears the same style of dress, which differs only in the quality of the material.

A European woman may paint her lips, use beauty spots, pencil her eyebrows, powder her face, or employ rouge; but if she does she will carefully try to conceal the fact. A Japanese woman does all this, and perhaps a little more, but she shows herself very proud of it and endeavors to make it appear that her beauty is the product of her art! And yet such art is not her own.

With us, it is usually the duty of the maid to embellish her mistress; but in Japan this task is relegated to the hair dresser, and while the massagists of women must always be blind, the hair dresser must have his eyes wide open in order to worthily respond to his title of "painter of the living," to use the Japanese expression.

And there is another difference, too, and one that does honor to the pretty Japanese women. Women in all European countries exhibit a special predilection for some foreign language. French women speak English and English women speak French, Russian, etc. A Japanese woman speaks nothing but Japanese. It is to her, moreover, that the Japanese language owes all the progress that it has made in the last century. She was of old forbidden to study the Chinese language, which was considered as the exclusive monopoly of men. The Japanese women took hold of their native tongue, and are present at the head of the literary movement of their country. Madam Murasaki is not the only one who has contributed to the development of this flexible tongue and exotic literature, for, in addition to her, there are at least thirty writers and philosophers in petticoats who are laboring for the greatest glory of the Japanese renaissance.

There is still another trait of character that distinguishes the Japanese from us Western people. We speak like true debauchees, while the Japanese abstain from immoral language and prefer to it more or less immoral acts.

The Japanese women, while competing with men, from a political and literary standpoint, have abandoned to them the monopoly of vice. So adultery on woman's side is almost unknown in Japan. What European country could say as much?

Exhibition of Mexican Products.

The Mexican department of the Pan-American Commercial Exposition was formally opened in New York last week. The exhibit is interesting in many ways. It furnishes plenty of evidence of the progress Mexico is making in the direction of mercantile production. Of the natural products the displays of opals and the tecali, or Mexican onyx, are especially beautiful. The most notable of the ancient Mexican industries are perhaps the feather pictures (a distinctively Mexican art), the gold embroidered hats, costing $50 and $75, the gorgeous serapes, and the carved woods. The more recent industries include beer brewing, the manufacture of castile soap from the coquito aceite, a fibrous plant peculiar to Mexico, and of a wonderful bleaching soap made from the maguey aloe, the cultivation of coffee, the manufacture of calicoes, meltons, cheviots, tweeds, and cottons in great variety, and the manufacture of valuable harness. The exhibition gives evidence of the presence of valuable natural resources, and of an energy and ingenuity seldom credited to our sister republic.

A Rat Causes an Electrical Fire.

A singular accident occurred recently to the electric lighting system of Baltimore. The lights of a large portion of the city suddenly went out with no apparent cause, many connections were burnt out, and the switchboard was found to be badly damaged. It was finally discovered that the trouble was caused by a rat which had chanced to step from one copper terminal to another, thus short circuiting the current. The rat's body was wet at the time, thus making it a good electrical conductor. It is estimated that 2,700 volts passed through the little animal, a sufficient voltage to produce 1,000 horse power. The rat's hair was burned off and the body had become rigid as if frozen. This accidental connection of the terminals caused a sheet of flame to spring from one set of terminals to the others, which burned off the rubber insulation of the wires, leaving them exposed, and set fire to the woodwork near them. It was found necessary to replace all the wires on the switchboard before the circuit could again be operated.

Interrupted Trial of the Ericsson.

The torpedo boat Ericsson was recently taken to Stratford, Conn., for a preliminary speed trial on the Long Island course. All went well with the boat until, when nearing the finish, the piston rod belonging to the low pressure engine broke, and this mishap was followed by the breaking of the flanges. The starboard engine was completely crippled and the Ericsson was brought to New London by the port engine. Just previous to the accident, her propellers had been running at 420 revolutions per minute, which is equivalent to 24 knots per hour. At the moment the rod gave way it was making 410 turns per minute. The accident will delay the final trial considerably, since the broken parts must be made in Dubuque, where the Ericsson was built.

THE TOWER OF THE NEW CITY HALL, PHILADELPHIA, PA.—THE LOFTIEST STATUE IN THE WORLD.

The tower of the new City Hall in Philadelphia has reached a height of 502 feet, and work has been for some time going on in placing the crowning statue of William Penn in position on the top of the dome. The figure stands upon the loftiest pedestal in the world. The statue of Penn is 37 feet high and weighs 60,000 pounds. The work of constructing it and of placing it in the lofty position has been one of considerable difficulty; and several interesting problems in mechanics have been involved.

The tower is itself an object of considerable interest. It is the third highest structure in the world, with a total height of 547 feet 3½ inches. The base to a height of 18 feet is built of granite; above this, to a height of 337 feet, the tower is built of brick, with a thin facing of white marble. The part above the marble is constructed wholly of metal, painted white to match the color of the marble below. The skeleton or frame work of this part is of wrought iron, faced with plates of aluminum bronze. The whole forms a very graceful structure, notwithstanding its great height.

Penn's statue, surmounting this elaborate pedestal, was designed by Alexander Calder, of Philadelphia. Mr. Calder has done his work well. The statue embodies the popular conception of Penn's character. In face and pose the figure is strong, though there is about it all a Quakerly air of gentleness and simplicity. He wears the Quaker garb of the seventeenth century with long straight coat and loose knee breeches.

A full sized figure was first modeled in plaster by Mr. Calder at the City Hall. This was then separated into fourteen horizontal sections and removed to the Tacony Iron Works, at Tacony, Pa., where the figure was to be cast. The castings were made direct from the fourteen sections, thus preventing any variation from the original design. The statue was cast in aluminum bronze, the walls of the statue averaging five-eighths of an inch in thickness. This work was accomplished without mishap, and no parts needed to be recast. The sections are provided with inside flanges three inches wide and these are pierced with one inch bolt holes. The bolts are also made of aluminum bronze to guard against the galvanic action which would occur between bronze and a more electro-positive metal.

After the castings had received the finishing touches at the foundry the sections were assembled in the courtyard of the City Hall and set up temporarily. The statue stood in this position for more than a year and has been examined by many thousands of curious spectators. The principal dimensions are as follows:

Height, 37 feet; hat rim, 23 feet in circumference; nose, 13 inches long; hair, 4 feet long; shoulders, 28 feet in circumference; waist, 9 feet diameter; legs, from ankle to knee, 10 feet; feet, 5 feet 4 inches long.

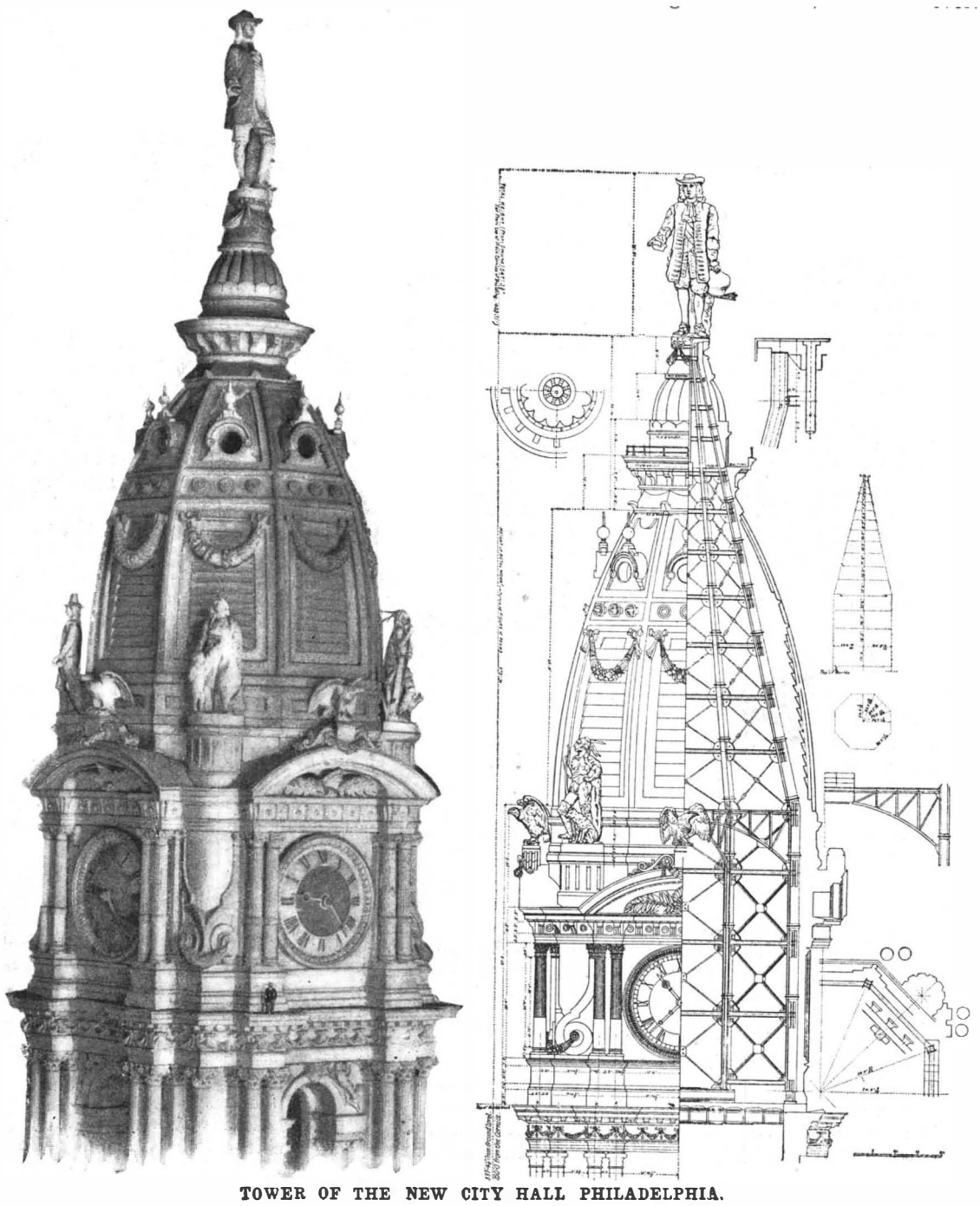
The tower is provided with a powerful steam derrick for hoisting the building materials into position. The statue has been separated into ten horizontal sections to make ready for hoisting. These sections are first raised to a temporary staging built about the tower at a height of three hundred and fifty feet. From there the sections will be lifted and placed in position by the use of a block and tackle attached to the upper part of a scaffolding built about the dome. All the holes in the inside flanges having been bored, it only remains to bolt the sections securely together. This is done, of course, by working inside of the statue. The base of the tree part of the statue is left open to provide a passageway to the interior of the figure.

The statue will be fastened to the top of the tower by a number of three inch bolts passing through the base of the figure and the plate forming the cap of the dome. The soles of the shoes are pierced with four bolt holes, and the base of the tree with about twenty-five holes, thus providing for some thirty bolts in all. The statue is a hollow shell supported by its own weight and will be without interior support or bracing of any kind.

THE PENN STATUE FOR CITY HALL TOWER, PHILADELPHIA.

As a counterpoise for the statue a cylindrical mass of metal two feet in diameter and five feet long is embedded in the center of the tower. Firmly attached to this is a shaft eight inches in diameter and thirty-three feet long, the upper end of which is flanged and keyed into the circular plate which forms the cap of the tower and the base of the figure. This base is a plate of aluminum bronze weighing thirty-five hundred pounds.

In carrying on this work only twelve men were employed, since the space at the extreme top of the tower is very limited. The workmen wear rubber-soled tennis shoes to guard against slipping, and the work is put off when it rains or when it blows so hard as to endanger their footing. All possible speed, however, has been used in getting the statue in place.



TOWER OF THE NEW CITY HALL PHILADELPHIA.

A New Railway Responsibility.

A remarkable instance of the value of expert scientific testimony in court occurred recently in St. Louis. The case, which is the first of its kind on record, was brought about as follows: A boy eleven years of age, who was standing beside a railroad track, as a train rushed by at high speed, was hurled to the ground and rolled under the cars by the force of the current of air caused by the motion of the train. A suit for damages was brought against the railroad on the ground that the boy was not on the track when the train passed, and, therefore, was not responsible for the accident. The defense claimed that a moving train creates no vacuum beneath the cars, and consequently no suction sufficiently powerful to move a body weighing, as in this case, some sixty-three pounds. Prof. Francis E. Nipher, a member of the Faculty of Washington University, was then put upon the stand to explain the scientific principle involved. He stated that, although the train did not create any suction at the sides or beneath the train, it nevertheless dragged a great current of air along with it. The movement of this body of air increases as the speed of the train is accelerated. The air nearest the train, of course, moves fastest, and the further one stands from the track the less one will find the air disturbed by it. Now if a person be standing near a rapidly moving train, the side of his body nearer the train is in a current of air which is moving faster than the air on the other side of him. This has a tendency to turn him around. It does not require a very great pressure of this kind to throw him down, and the revolving motion his body has acquired serves to roll him toward the track when he strikes the ground. The body is, therefore, turned in a direction which is certain to make it roll toward the rails, and the boy was undoubtedly drawn under the cars in this way. The expert scientific testimony carried the day, and the railroad was obliged to pay the damages, $5,000.

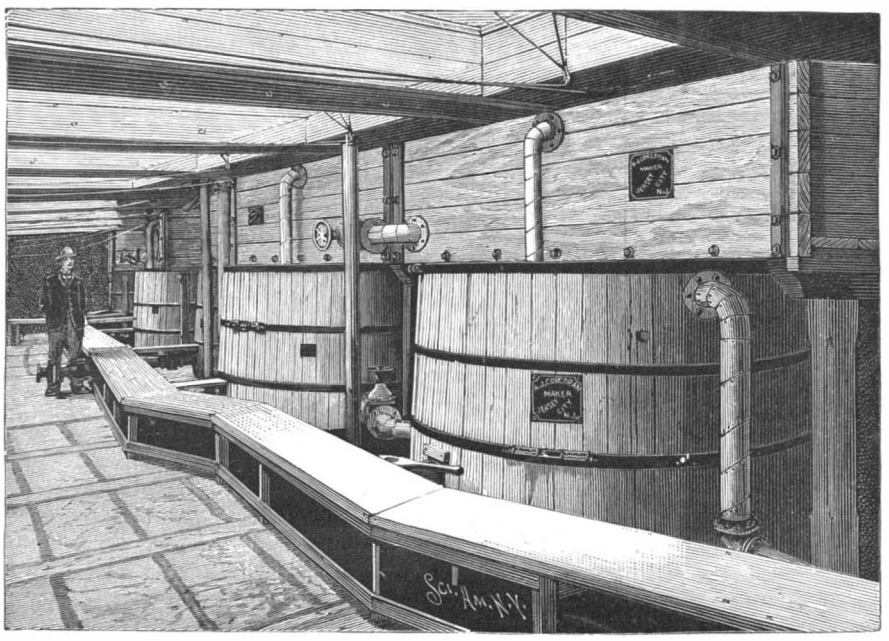
Testing Torpedo Tubes.

A series of experiments were recently commenced at the Brooklyn Navy Yard to test the alignment and accuracy of the torpedo tubes of the second class battle ship Maine. It was especially desired to verify the scale on the rotary track used for aiming the torpedoes, and to find if this scale agreed with the one in the torpedo-aiming and conning room. For this purpose a dummy torpedo of the Whitehead type was used in the ship's starboard midship tube. The charge of powder used in the test was only large enough to set the torpedo in motion. When all was ready, the torpedo was aimed at the stern of the receiving ship Vermont, near by. On setting off the charge a slight shock was felt on board the Maine and a moment later the torpedo came to the surface some fifty feet away. It was found to be exactly on the line aimed, thus proving that the tube was in perfect condition and that the two scales corresponded accurately. The remaining tubes will be tested in the near future.

NEW AQUARIUM FOR NEW YORK.

New York City is soon to have probably as fine an aquarium as is to be found anywhere. It is with pleasure that we present to our readers some views of the interior of Castle Garden, one of the famous buildings of old New York, which for the future is to be devoted to the uses of an aquarium under the auspices of the Department of Public Parks of the city government. The larger engraving presents a view of the main floor, looking down from the gallery.

On the ground floor have been established seven large pools, whose walls of brick and cement, capped with stone, have been built up to a height of about 3 feet, and which are arranged to hold water having a depth of from 3 to 6 feet. They are lined with white porcelain tiles. The central circular pool, 28 feet in diameter, is to be the home of a large white whale. In the other tanks some of the larger forms of salt water life will be cultivated, such as seals, sea lions, sharks, anglers, and turtles. Around the walls of the building, in two tiers, are glass-faced tanks, also lined with white tiles, which tanks are designed to contain the small varieties of fish. The wall tanks present the appearance of a picture in a picture gallery, and when filled with fish and supplied with absolutely pure water a most enchanting gallery of sea life will result—a very instructive form of living picture. The glass fronts, 1 inch thick, are of special plate glass, of composition to resist the effects of salt water.



THE NEW YORK AQUARIUM—THE CORCORAN WATER TANKS.

The great storage tanks were erected by A. J. Corcoran, of 11 John Street, New York City. They are all made of cedar. Six of them are round, and have steel bands fitted with the Corcoran adjustable lugs and draw rods with friction plates, by means of which any shrinkage of the wood may be taken up without "driving" the bands. Arranged on trestle work are six other rectangular tanks, so supported as to stand immediately over the round tanks, and so substantially and correctly made that there is not any leaking, although the conditions are about as trying as can well be imagined, inasmuch as the space they occupy is over the boilers, and a large portion of the roof is of glass, exposed to the full force of the sun's rays.

In order to obtain the greatest capacity possible for the available space, the tanks are of various shapes and sizes, some capable of containing about 2,000 gallons each, and they are arranged with a view to convenience of connecting with the filters and with the distributing pipes, which, with the numerous valves, are of hard rubber. It would be difficult to find another such a collection of tanks giving such perfect satisfaction. One of the salient and most attractive features of the aquarium is the use of salt water, which is taken directly from New York Bay. It will be remembered that Castle Garden is situated at the extreme southern extremity of New York City, and is almost entirely surrounded by water, and hence is a particularly available spot for use as an aquarium. The water, as it is pumped from the bay, is somewhat charged with sewage matter. It is therefore first passed through Carter pressure filters, which are of Tobin bronze and thoroughly non-corrosive, and when delivered to the Corcoran storage tanks it is not only purified, but presents a most beautiful, crystal-like appearance. From the cedar tanks the water passes through the hard rubber pipes to the numerous porcelain-lined and glass tanks, in which the fish, etc., are kept. The specimens are being collected and arranged under the efficient direction of Prof. H. T. Woodman, designer and superintendent of the aquarium, which it is intended shall be the most complete in the country.

The methods employed for collecting live fish from all parts of the world to stock New York City's great aquarium will be found to be for the most part exceedingly curious and interesting. The fish are caught in most cases especially for this purpose. The fishing is done with nets, and great care must be exercised not to remove the fish from the water or to injure them in any way. The most difficult part of the work, however, is that of transporting them for great distances. For this purpose the New York City aquarium supplies cans of its own, and these are frequently sent to the very ends of the earth. They are made of galvanized iron and in size and shape resemble huge wash boilers. The largest are about four feet in diameter. The sides of the cans are vertical, though all are curved slightly inward at the top. This is to cause the swash when the cans are moved to fall inward and so, to some extent, to make the water self-aerating. Foreign fish are usually brought by steamer. A sailing vessel takes so much time to make a voyage that it is difficult to preserve the fish in their narrow quarters. The fish brought from Japan, for example, are shipped by steamer across the Pacific Ocean. A man familiar with their needs is sent from the aquarium in New York to accompany them and care for them on the route. At San Francisco the fish are carefully examined and fresh water is supplied. The journey across the continent is then made by express trains. The method of bringing fish from other foreign lands, or, rather, foreign seas, is about the same.

The fish to be found in local waters are secured with less trouble. At Gravesend, where the larger part of the aquarium stock is kept, two men are employed to go out at all hours of the day or night when the fishermen are taking in their nets. These are carefully examined to discover if anything of interest is in them. During the season a man is sent from the aquarium on every steamer to the fishing banks to watch for valuable specimens of local varieties.

THE French industry of icing milk is an original departure in tinned commodities. The milk is frozen and placed in block form into tins, and on the part of the purchaser requires to be melted previous to use. Being hermetically sealed, the commodity thus iced preserves its form until it is required, when a minute's exposure to the sun's rays or to the heat of the fire is all that is necessary to reduce it to a liquid condition.

THE NEW YORK AQUARIUM—VIEW OF MAIN FLOOR.

The Marine Biological Stations of France.

There are at the present day some twenty-six well equipped marine laboratories in Europe for carrying on biological research. Seven of these are situated on the French coast and are maintained by the universities of France and the French government. They offer many advantages to the student of biology. They make possible a thoroughly practical course of instruction, for the materials are all at hand and may be collected with the least possible expenditure of time and energy. The stations bring together every winter the best workers of many universities, and the work is frequently rewarded by valuable discoveries.

The stations are especially noteworthy for the ingenuity of arrangement and completeness of their laboratories. Of the seven, the station situated on the coast of Brittany, at Roscalf, is perhaps the most typical. The coast of Brittany at this point is particularly well adapted for carrying on such investigation. The greater part of it consists of massive bowlders, surrounded by swift-running currents, and often these rocks are exposed to a depth of forty feet, thus making it possible to gather sea fauna in great abundance and variety. The laboratory at Roscalf has been constructed on a very ambitious scale. It is supplied with a large glass-walled aquarium room, a workshop partitioned off for a dozen investigators, a well furnished library, a laboratory for elementary students, and a commodious lodging quarters. A strong inclosure of masonry forms a vivier, which is used for experiments, and also supplies water for the laboratory. Most of the students here are from the Sorbonne. They make collecting excursions in the small sailing vessels owned by the laboratories and carry on a variety of experiments under competent teachers. The second station of the Sorbonne is at Banyuls, on the Mediterranean. The laboratories here are equipped much the same as at Roscalf. The bright colored fauna of southern seas, however, can be obtained only by diving, and a complete diving apparatus is in constant use.

Other stations similar to these described are situated at Marseilles, Ville-Franche, Arcachon, Sables d'Olonne and Wimereux. Each has some particular advantage of its own, and it is noteworthy that a large portion of recently published research is dependent directly or indirectly upon their combined efforts.

The Japanese Language.

The interest now felt respecting the Japanese, whose prowess and success has been so marked in their war with the Chinese, induces us to give a brief review of the subject of their language, about which but little is generally known.

The Japanese language was long regarded as being either a simple dialect of the Chinese, or, at least, as having the same relation to it that Italian has to Spanish, or that both have to their common parent, the Latin. This, however, is an error. The Japanese understand written Chinese, it is true, because Chinese characters form a part of several systems of writing used in Japan. This is intelligible enough when we reflect that the Chinese characters represent, not letters, or sounds without meaning, which are simple elements constituting words, but the words themselves, or rather the ideas which these words express; and, consequently, they ought to communicate the same ideas, even though expressed by different words, to all who understand the meaning of the characters. It is thus that the figures 1, 2, 3 express the same idea of numbers to the inhabitants of different countries. The deeper and more extensive knowledge of Asian tongues that has been acquired of late years by European philologists has rectified many of the errors that formerly prevailed on the subject of the Japanese. The learned Klaproth, in Asia Polyglotta, states that this language differs to such a degree from every other in its construction, grammar, and other characteristics, that we might justly conclude that the people by whom it is spoken form a distinct race.

Fisscher states that the sounds of the Japanese language are soft and agreeable, and the construction of it admits of very important modifications as regards euphony. Written in European letters, nearly every character is a vowel, and when consonants come together and vowels are omitted it is generally the case that the consonants in this relation are easily pronounced, as shrano for shirano, though the rule has many exceptions.

Meylan says that, unless born in Japan, it is impossible for one to pronounce certain letters correctly. This author adds that there are no pronouns in Japanese, and that the words are declined by means of short words affixed. In fact, the preposition changes the name and character in Japanese, although it follows instead of precedes the word. As for the verbs, they change neither in number nor person, but are modified by time and voice.

The language is very rich and copious, for not only may its writers employ its own resources, but they may also have recourse to those of the Chinese, and the two tongues are easily combined or separated, according to caprice.

The Japanese have an alphabet of forty-eight letters, which may in one sense be doubled by means of signs joined to the consonants to modify their sound and render them softer or harder. This alphabet dates from the eighth century, and may be written in four different series of characters. These are the "Kata-kana," which is regarded as appropriate to the use of men; the "Kira-kana," peculiar to women; the "Manyo-kana" and the "Yamato-kana." In addition to these there is a learned character used by the Chinese. All scientific works, with those belonging to the higher branches of literature, as well as official papers and public documents, are written or printed in Chinese characters. The learned, however, employ their own "Kata-kana" to gloss works printed in Chinese characters.

The Japanese, like the Chinese, write in columns from the lower to the upper part of the paper, beginning at the right. It may be well to mention that, in addition to the four usual alphabets, the Buddhists use the alphabet of the Sittan writings, consisting of fifty letters.

According to Klaproth's researches, it appears that until the reign of Ouzin Tenwo, the sixteenth mikado, the Japanese had no writing at all, all ordinances and laws being proclaimed viva voce. Under the reign of this prince Chinese characters were first employed. In the year 284 B. C., Ouzin Tenwo sent an embassy to the kingdom of Hakon-sai (which existed at that time in the southeastern portion of Corea) for the purpose of obtaining learned men capable of introducing civilization and literature into his dominions. On his return the ambassador brought with him the celebrated Wonin or Wang jin, who well accomplished the task confided to him. From the time of his arrival he was charged with the education of two princes. At a later period his descendants filled many important military stations, and his own merit appeared so great to the Japanese that they ultimately decreed him divine honors. Since the days of Wonin Chinese characters have been constantly used in Japan. Nevertheless, since, as above stated, the Japanese language differs essentially from the Chinese, and as the same character in Chinese has frequently very different meanings, it was found necessary to effect important changes. Consequently, at the beginning of the eighth century, an alphabet was formed from different portions of the Chinese characters, and named the Kata-kana, which signifies "parts of letters." This is employed either at the side of or directly intermingled with Chinese characters; at the side to indicate pronunciation or meaning, and among them to point out grammatical forms or idioms rendered difficult by the use of isolated characters. Tradition attributes the invention of this alphabet to a scholar named Kibi. After him flourished Koubo, the inventor of another alphabet having especial application to the Japanese without relation to the Chinese. It is called the Hira-kana.

On the subject of the invention of the third alphabet, the Japanese tell us that in the year 1006 A. D. a Buddhist priest named Ziakou-so left Japan for the purpose of bearing the annual tribute to China. He could not speak Chinese, but, as he wrote it very well, he was recommended to prepare a list of Chinese characters with their signification in Japanese. On this occasion he composed forty-seven letters for the use of his countrymen, and which were adopted because the alphabet which came from India (the Buddhist) consisted of as many. A forty-eighth syllable was afterward added. There is yet another ancient alphabet, which is known as the Manyo-kana. The characters of this are frequently mingled with those of the other two; the order of the letters is the same, and it is composed of complete Chinese characters in the ordinary form, and equally in running hand. Many characters are employed at different times to indicate the same syllable. It may be remarked that the Chinese characters which compose this alphabet, as well as those of all the others, do not invariably express the Chinese sound of the words which they represent. Thus, the Chinese character kiang, "river," represents the syllable ye, which in Japanese has the same meaning, just as the character neu, "female," represents the syllable mi, which has the same meaning in Japanese.

Finally, there is another alphabet, composed of Chinese characters greatly abbreviated, which is called Yamato-kana, or "Japanese writing." It gives us an example of one of the methods of employing Chinese characters in Japanese. Yamato-kana is formed of three characters, the first being an ancient name of Japan. It is read Yamato, though written with the vowel sound i; the second, conformably with its meaning in Japanese, is called na, or "name," and from the combination of the two is derived kana, "syllable," or "character."

We may add that, with the exception of the Kata-kana, these different alphabets are rarely employed alone. Generally the characters of three or four alphabets are mingled together, without regard to any rule, and this renders the whole much more difficult to decipher. And, as if the difficulties were not already great enough, Chinese characters are mingled here and there with or without the indication of their meaning at the side, all according to the caprice of the writer; so that if we consider the number of signs of each of the five alphabets, and of their variations (which may be called synonymous signs), forming a total of about five hundred; and if, finally, we reflect upon the limitless use which the Japanese make of Chinese characters in the running hand, as well as in the ordinary form, we must admit that the literati of Japan have succeeded in making their language probably the most difficult in the world to read. The affinities existing between Chinese and Japanese writing are so numerous that, before making a satisfactory progress in his own language, the Japanese must have learned three or four thousand Chinese characters, and, with them, an incredible number of combinations, modes, and different alphabets. It will, therefore, be readily understood that a great portion of the education of a Japanese scholar is passed simply in learning to read and write. Chinese books are occasionally prepared for the Japanese public in their original form. The prefaces of books are frequently written in Chinese, while the body of the work is in Hira-kana, in which case the running hand is often employed. This greatly increases the difficulty of reading the text when the scholar has learned only the ordinary form.

The Ramie Industry in France.

The United States consul at St. Etienne says, in a recent report to his government, that a French society was formed, some years ago, to develop the cultivation of ramie in Spain and Egypt, two countries affording most favorable conditions of soil and climate. The Spanish proprietors willingly consented to the experiment; but, being absolutely without the necessary means, they had to draw largely from the treasury of the society, and, at last growing discouraged, the experiment was abandoned. In Egypt, success was not greater. Although the plant took kindly to its new home, the cost of irrigation became very onerous, and, in the end, the society had to go into liquidation, after having lost 4,500,000 francs. In the meantime, a manufactory, for the spinning of ramie thread, and converting it into tissues, such as sailcloth, table linen, curtains, etc., was organized at Avignon. The creditors of the society in liquidation, believing that the ramie industry would succeed in the end, abandoned to a new board of directors the factory for a certain number of years, on the condition that a large portion of the dividend should be appropriated to the extinction of the debt, which amounted to 600,000 francs. There is already, says the United States consul, every hope of success. Abandoning all idea of establishing plantations in Europe, the company imports the raw material direct from China, where it has already passed through the first and somewhat incomplete operation of decortication. On its arrival at the factory, it is passed a second time through a decorticating machine, of which M. Favier, the manager of the company, is the inventor, and finally relieved of all the glutinous matter by a chemical process, of which M. Favier keeps the secret, but which is supposed to consist of a weak alkaline solution, in which the fibers are boiled. It is then spun into thread, when it is ready for manufacturing the articles already mentioned. The factory employs at present about 200 hands, men and women, and the business done represents a value of about 1,000,000 francs (£40,000) annually. Manufactured ramie is a little dearer than cotton or linen goods, but its durability is said to be threefold that of the latter. It is claimed that it will always preserve the original gloss. The factory does not, it is said, intend to continue the manufacture of tissues, but will confine its business to spinning, so as to furnish the large weaving industries with thread. The actual price of the thread ranges from 4 to 12 francs per kilogramme (from 1s. 6d. to 4s. 6d. per pound), but the company asserts that as soon as the cultivation of ramie becomes developed in other countries (South America especially) these prices will be much lowered. Besides this branch of the industry the company manufactures ramie pulp for the making of paper of all kinds, but especially for that intended for bills of the Bank of France. This bank has made a contract with the company, by which the latter is obliged to keep in stock for the bank 20,000 kilogrammes of pulp in one of the bank's large storerooms at Marseilles, and to have on hand 20,000 kilogrammes more, while the bank itself has always a similar amount in its paper manufactory near Paris, making in all 60,000 kilogrammes at all times available. The price of the pulp is six francs per kilogramme (about 50 cents per pound), and it is said that the notes made with this material are not only stronger than others, but they defy imitation.

A Good Idea.

Owing to frequent complaints from America of swindling operations by alleged patent lawyers in London, one such firm has been broken up, and the United States embassy warns American inventors to be cautious in dealing with people in London offering to take out English patents.—American Machinist.

Baron Soll's Discoveries.

Baron Soll's expedition in 1893 to Arctic Siberia and the New Siberian Islands has proved to be one of the most successful explorations of recent years. The results of the expedition include over 3,000 miles of survey based upon thirty-eight positions astronomically determined, some nine months of meteorological observations in the tundras, in a series of important measurements of elevation above the sea along the whole route, many interesting photographs and rich collections of botanical, zoological and ethnological specimens. In the New Siberian Islands Baron Soll found under the permanent ice a sedimentary deposit containing pieces of bones of mammoths and other post-tertiary mammals, and complete trees fifteen feet long, with leaves and cones.

This is conclusive proof that when the mammoth wandered over Europe and Asia, trees and vegetation reached to the seventy-fourth degree of latitude, thus making its northern limit at least 200 miles north of its present boundary line. The discoveries include much of interest to geologists concerning the position of Siberian glaciers and the many varieties of fossils to be found beneath them.

The achievements of this expedition prove that the most desolate regions of ice and snow are fertile fields of study to the intelligent investigator.

Consumption in Dairy Herds.

The agricultural experiment station connected with the University of Vermont publishes a valuable report on the eradication of "consumption" in dairy herds. The experiment station in which these tests were made is supported in part by the State and is in charge of the university professor of agricultural chemistry. The report shows that during the past year the tuberculin test has been applied more than 1,000 times and that the presence of the disease was indicated in 222 of these animals. After these had been killed it was found that 220 of the 222 were unmistakable cases of tuberculosis. Tests applied to the cattle throughout the State of Vermont showed that only 39 "consumptives" existed in 81 herds, which contained in all 662 animals. This is less than 6 per cent and is considered a very good showing. It was found that in 24 per cent of the infected cows that were killed the disease had become

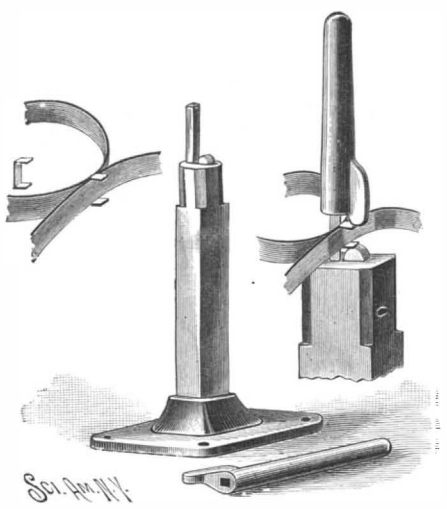


Fig. 2.—TOOL FOR APPLYING FASTENING CLIPS.

developed in the udder. In accordance with the recent decision of the cattle commission, an inspection was made in Massachusetts which showed that a considerable number of the animals brought to the cattle markets in Brighton and Watertown were tuberculous. Out of 241 animals tested 25 were found to be diseased. The percentage of nearly 10 per cent in this case is dangerously large when it is considered that these cattle are sold for wholesome beef. In the future all cattle received at these stations will be carefully examined.

Report of the New York State Fish Commissioners.

The annual report of the State Commissioners of Fisheries for the past year states that the output of fish exceeded by eighty per cent the output of the preceding year. This is especially gratifying, since the work was accomplished without expending more money than in previous years, or in employing more workmen. A large part of the fish hatched were food fishes. The following figures will give some idea of the magnitude of the work. The total number of fish fry distributed during the year was 136 000,000. Of these, 2,982,500 were brook trout, 565,000 California trout, 5,415,000 lake trout, 18,112,000 whitefish, 12,012,000 ciscoes, 2,976,000, muskallonge, 22,603,000 smelts, and large quantities of salmon, lobster, black bass, yellow perch, carp, tom cods, and other less important varieties. The commissioners in closing their report state that at present there are as many hatcheries as can be worked to an advantage and that the legislature should refuse to grant any money to establish new ones.

VENETIAN OR BENT IRON WORK.

This beautiful work, now so popular, has been admired by all visiting the sunny shores of the Adriatic. As a rule they have returned laden with costly specimens of the art.

These objects, which at first sight appear so intricate and difficult, can easily be made by any one possessing the requisite tools.

On examining the work it will be found to consist of strips of iron bent into spirals and fastened together with binders which clasp the pieces at their points of contact. The spirals in nearly all cases have the form of an S, a C, or some modification thereof, and these being fastened in different combinations produce the desired pattern.

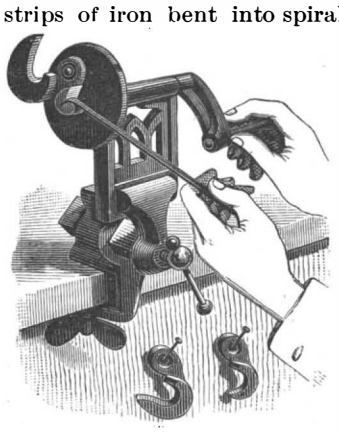


Fig. 1.—TOOL USED FOR BENDING THE SPIRALS.

The strip is first cut the required length, after which the ends are coiled by the simple apparatus shown in Fig. 1, the form being adjusted to produce a spiral of the required size. It is the custom with the modern Venetian workman, as with his forefathers, to coil these strips with a pair of pliers. This method requires an expert with that tool to produce a spiral that is at all symmetrical. After the spirals are formed a binder is bent and clasped around the piece, but this fails to bind them tightly, the pliers being the only tool they use for the purpose.

Messrs. A. F. Weed & Co., 106-108 Liberty Street, New York City, have popularized this work and place it within the reach of every one by the introduction of their special patented tools, designs and material, which enable the amateur to produce these beautiful pieces in the shape of candlesticks, candelabra, photo frames, grilles, brackets, lamps, hanging lanterns, etc., which excel in symmetery and strength the work produced by the Venetian artisan.

A perfect spiral is produced by the Weed apparatus by inserting the strip as shown, and turning the handle forward one and one-half revolutions. Three different size spirals can be made by using the different attachments.

The Weed binding tool for applying the fastening clips, and the manner of using it, are illustrated in Fig. 2. The parts, including the fastening clip, are placed on the binding tool and a few light taps on the plunger fasten the parts securely together.

The iron for making the spirals is drawn with slightly rounded edges to prevent injury to the fingers, and to impart a desirable finish.

A specimen of one of the many forms of work that may be made by the Weed tools is shown in one of the engravings.

Irish Moss.

A little town, known as Jericho, in Massachusetts, seems to be the center of this industry. We gather these notes from a paper which was printed lately in the Boston Herald.

Boys, men and women all engage in the work, which consists spreading it upon the beach prepared by raking all the dirt, stones and driftwood away, and leaving a fine bed of white sand; when the weed is first brought in by the boats, each of which gets about a barrel and a half, it is taken upon creels, a sort of barrow, and spread out upon the beach; it is turned over daily as in hay making, for the space of two weeks; each morning it is washed in clean sea water (fresh water ruins it); it is then gradually bleached, as when first gathered it is of a light green color, and in the course of a few weeks becomes successively red, pink, and finally nearly white.

Stormy weather is a great drawback to the mosser's work. Some of the moss that the storms tear loose and scatter upon the rocks is gathered and classed as hand picked, bringing generally a quarter or one-half cent per pound more than that gathered in the usual way for commerce.

Should a spell of rainy weather come on during the season of gathering, heavy unbleached muslin covers are used to protect the moss, which is packed up in heaps.

Two crops are obtained each year, the first one being the better; the late crop is liable to be injured by a little black vegetable growth called glut, caused, it is said, by the warmer water of August days.

Another Mastodon.

The bones of a mastodon have been found recently on the Rupel farm, near North Liberty, Ind., in clay soil, 8½ feet below the surface. Above was sand and gravel. The tusks were 8½ feet long, and the teeth weighed from 5½ to 6 pounds apiece. About one-fourth of the bones of the animal were dug out, and are on exhibition in North Liberty.

Reform Printing Bill.

The reform printing bill, which provides for the public printing, binding and distribution of public documents in a new and much more efficient manner than heretofore, was passed in the House of Representatives recently, and its passage in the Senate is expected in the near future. The new law will considerably lessen the cost of the public printing and binding. Its most important work, however, will be in bringing about a more intelligent distribution of government publications. Copies of these will be placed in depositories throughout the country, where they may be readily obtained and consulted by every one. The bill further provides for the distribution among public libraries of all the old United States documents which have been accumulating for years and at present take up much valuable space at Washington. These number upward of 1,000,000 volumes, and in the future they will not be allowed to accumulate. The bill includes a further provision for the publication of a monthly catalogue of current publications, giving the price of each and the place where it can obtained, and also for an index of the publications ordered at each session of Congress. It is estimated that the enactment of this law will result in an annual saving of several hundred thousand dollars.

To Prevent Dampness in Walls.

The following method of preventing dampness in walls is said to give very favorable results. Two preparations are made by dissolving castile soap in water in the proportion of three-quarters of a pound of soap to one gallon of water, and by making a solution of alum in the proportion of one-half a pound to four gallons of water. Both solids should be thoroughly dissolved before using. The walls to be coated should be perfectly dry and clean, and at the time of applying the preparation the temperature should not exceed fifty degrees F. The first or soap wash should be laid on when boiling hot with a flat brush. Care should be taken to form a froth on the brickwork. This wash should be allowed to remain twenty-four hours to become thoroughly dry and hard before the second coat is applied. The alum wash should be applied in the same way, except that the temperature of the solution need not be more than sixty or seventy degrees F. Another twenty-four hours should elapse before the second coat of soap should be put on. After this the two preparations should be applied alternately until the walls are rendered impervious to water. The combination of alum and soap forms an insoluble compound that fills the pores of the surface and effectually excludes all moisture.

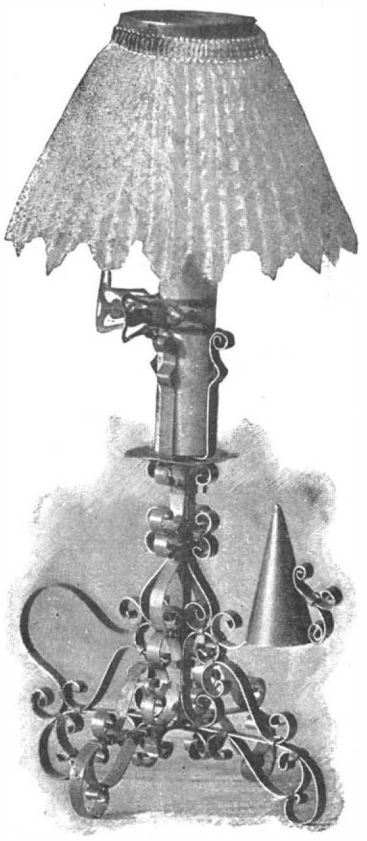


Fig. 3.—BENT IRON CANDELABRA.

A Dangerous Experiment.

An explosion occurred in a drug store in Philadelphia recently, resulting in an injury which came near to the destruction of the eyesight of the person injured. The American Journal of Pharmacy says: A druggist was experimenting on the action of ammonia water with oxide of silver, and had left the mixture in a porcelain capsule covered with water and a glass stirring rod in the capsule.

A salesman coming into the store thoughtlessly took up the rod and without agitation was replacing it in the capsule when a violent explosion occurred, shattering the capsule, pieces of which struck him in the face, causing damage which it was feared would result in the loss of one or of both eyes. Prompt treatment, however, warded off the threatening mischief.

The product obtained by the action of ammonia on silver oxide, known as "Berthollet's fulminating silver," is a dangerous article. When dry, it explodes violently on the slightest percussion, or even when touched with a feather. The black crystals, having a metallic luster, decompose violently with detonation when the liquid containing them is shaken.

The exact composition of the compound has not yet been ascertained.

RECENTLY PATENTED INVENTIONS.

Engineering.

REVERSING GEAR AND GOVERNOR.—Thomas T. Waggoner, St. Louis, Mo. This is a combination mechanism for conveniently reversing the engine by an ordinary reversing lever, maintaining also an automatic and sensible governor to control the speed of the engine. The invention consists principally of a pivoted eccentric carried around on its pivot by the driving shaft of the engine, the eccentric being connected by the usual strap and rod with the engine valve, and being controlled in its swinging motion from weighted levers pivoted on supports attached to the driving shaft.

PUMP.—Artimus W. Shidler and William P. Hendrickson, Farmington, New Mexico. According to this invention a pulley is journaled in a hanger suspended in the top of a well, above which is arranged a tilting lever carrying a cable extending around the pulley, the cable also carrying a sucker rod provided with the usual pump piston. The improvement is particularly adapted for use in deep wells, and is readily applied to a driven well, obviating the use of heavy pump rods and much other mechanism necessary in pumps of the usual construction.

HYDRAULIC RAM.—Charles B. Jones and John S. Wetmore, Roanoke, Va. The construction of this ram is such that the path of the water entering the induction side and emerging from the check valve in the air chamber is in a straight line, thus conserving the power of the descending column and increasing the efficiency of the ram. The base has a direct passage from the induction pipe to the check valve, and is furnished with a valve chamber having a cap with a spherically concave valve seat to which is fitted a valve, there being adjustable guides for the valve stem, and, in combination with the induction passage, an air tube for maintaining a supply of air in the air chamber.

Electrical.

SUPPLY SYSTEM FOR ELECTRIC RAILWAYS.—Zebulon Foster, Chicago, Ill. According to this invention the conductor is made up of aligned, insulated sections, arranged alongside of a continuous or main line conductor, and the several sections are successively brought into electrical connection with the main line as the trolley passes over them. The line wire has a series of branches whose free ends are inclosed in an air-tight casing, and independent conductor sections are arranged opposite the terminals of the branches, springs holding the sections and branches normally separated, and their engagement being effected by the trolley mechanism.

SPEED INDICATOR AND ALARM.—George A. Thompson and John F. Schmadeke, Brooklyn, N. Y. This is a device especially adapted for use on electric cars, to close an electric circuit when the speed reaches a certain point, when a bell is rung or a lamp lighted, to indicate that the speed of the car should be lessened. A contact rod is held in an insulating block at a distance which may be regulated from a sliding rod, the latter being moved toward or from the contact rod according to the swinging of arms on the ball governor principle from a shaft connected with the car axle. The device may be adjusted so the circuit will be closed at any desired speed.

Railway Appliances.

SLEEPING AND PARLOR CAR.—Linford F. Ruth, Connellsville, Pa. Among the leading features of this car is a system of pneumatic cushions connected to the compressed air pipes, to be inflated by opening valves, or collapsed and compactly stored, the mattress also being similarly inflated and collapsed, according to the period of use as a parlor or sleeping car. It is also designed by this improvement to lessen the expense of this class of rolling stock, reducing its weight and increasing its range of usefulness, while promoting cleanliness. The top-heaviness of the ordinary drawing room car is also overcome by doing away with the heavy upper bunks and seat frames.

LOCOMOTIVE DRIVE WHEEL BRAKES.—Walter O. Pelham, Taylor, Texas. This is a device for releasing the brakes of the drive wheels when the engine is reversed and the air brakes applied, to prevent the drive wheels from being locked and sliding on the track rails. The invention consists of an auxiliary piston connected with the triple valve piston and controlled by back pressure in the steam chest, the release being governed by pressure in the oil pipe, and this pressure being air when the engines are reversed and steam when there is back pressure in the cylinders and steam chests.

RAILWAY SWITCH AND CAR REPLACING MECHANISM.—Albert S. Debose, Cuero, Texas. Combined with the main rails and detachable switch or replacing members having pivot lugs and undercut recesses at their front end are guide blocks adapted for detachable connection with the rails, their rear ends tapering with the upper face of the rails, and their front ends having sockets and recessed portions to receive the lug ends of switch or replacing members. The several parts are detachably connected and can be readily assembled and fitted in position without the use of spikes or bolts for use either as a switch mechanism or as a car replacing means.

TRACK JACK.—Joseph McMurrin, Shoshone, Idaho. This jack comprises a supporting frame in which is arranged a vertical screw carrying a lifting sleeve, a swinging lever being mounted above the screw and operatively connected with it. There is a ratchet on the gear shaft connected with the screw, and by engaging one pawl with the ratchet and working the lever up and down the screw is turned in one direction, while with another pawl in engagement with the ratchet the screw is reversed. It is a strong and easily operated jack by which a rail may be quickly and easily arranged.

Mechanical.

NUT LOCK.—George E. Smouse, Everett, Pa. According to this improvement a key and ratchet are employed to adjustably hold the nut from unscrewing, the bolt being grooved in its thread and the nut having locking projections on top, while a spring pawl is employed having an integral depending key, a key flange being formed at right angles on the key along one edge. The improvement renders the application of the nut to the threaded bolt very easy, and a reliable locking of the nut is effected.

WRENCH.—William C. Lawrence, Casselton, North Dakota. This tool is especially adapted for use as a pipe wrench, having superior clutch or holding power, and being rapidly and easily adjustable. It will clutch any article placed between its jaws, from the smallest rod to its full capacity, never slipping when it once has a bite on the article. In its manipulation, the pivoted upper jaw permits the wrench to be readily carried backward for a new grip. It obtains an eccentric grip upon the pipe, and may be operated with one hand.

SOLE CHANNELING AND ROUNDING OUT MACHINE.—George F. Fischer, Rochester, N. Y. This machine automatically rounds out sole after sole from a pile of leather blanks, channeling and grooving the soles and discharging them completed, then cuts off the power until the machine is again charged. It also rounds or cuts out insoles. The stock for insoles and outsoles is placed on separate tables, and a carriage moving backward and forward simultaneously drops different sets of adjustable knives to do the work, the insoles being left clamped between the pattern and the table. Trip arms and trip fingers connected with the carriages and supports automatically shift the bars of each carriage to throw them into rack engagement with the main driven shaft. The mechanism is very simple, all parts being constructed to operate in unison.

GLAZIER'S TOOL.—George A. Rogers, Allegheny, Pa. This is an adjustable glass breaker attached to any part of the glazier's diamond glass cutter, whereby the glass may be more accurately and securely broken along the line of cut, regardless of varying thickness in the sheet of glass. The device is to take the place of the comb or notched or slotted glass breaker heretofore used, and may be made always to fit the glass closely.

Miscellaneous.

MUSIC LEAF TURNER.—James Flemming, Buffalo, N. Y. This is a simple device to be attached to a piano or other musical instrument, and provided with a series of arms which may be conveniently arranged behind the music leaf to be turned. On the striking of certain keys or fingers mechanism is released which actuates the arms and swings them around to turn the leaves. There is a key for each rod, and the keys project forward far enough to enable them to be easily struck by the finger.

TREBLE BRIDGE FOR PIANOS.—Christian L. O. Altenburg, New York City. This is a bridge supported at one end in such manner that the treble strings pass over its free, vibrating end, the bridge being fastened at one end on the string frame and its free end extending into a recess of the frame. It is designed that, with this arrangement, the short treble strings when struck by the hammer will give a full and sweet sound.

BICYCLE LAMP.—David Jackson and John Osterloh, New York City (No. 9 East 12th Street). This invention provides a lamp of simple and durable construction, to insure proper combustion and a steady, good light that is not liable to jar nor blow out. The lamp is adapted for burning either ordinary kerosene oil or the more expensive illuminants without changing the burner or wick; by the peculiar arrangement for the introduction of air and feeding it through an air chamber below the burner. The lamp is small, light in weight, of the shape most generally used, and inexpensive to manufacture.

VEHICLE RUNNER ATTACHMENT.—Walter J. Le Barron, Barre, Vt. This is a readily operated device, applicable to any kind of wheeled vehicle, to enable the latter to be mounted on runners, or the runners may be readily moved out of the way for the vehicle to run on wheels. With this attachment a baby carriage may be conveniently supported for use as a cradle. The invention comprises reach rods detachably secured to the axles, and carrying hangers to which the runners are pivotally connected, a locking slide bar connected to the hangers having a handle portion movable on a guide.

ROAD SCRAPER.—John D. Libey, Lima, Ind. According to this invention the scraper is pivotally connected with a wheel-supported frame, a double windlass made in two parts for joint or separate action raising the front or rear of the scraper, while there is also a scraper-supporting frame below the axles. This scraper will take up, carry and deposit earth, being operated easily by one man, and may be used wherever earth is to be leveled or removed.

WAGON DUMPING DEVICE.—Thomas Wright, Jersey City, N. J. This is a simple device for attachment to the body and running gear of a freight wagon, for conveniently tilting the body rearwardly to discharge its load. Parallel frame bars are bent downwardly near their rear ends, and two dumping bars are pivoted near one end on each of the frame bars. A body supporting device is slidable on the dumping bars, and elliptical springs are loosely connected at their ends to the frame bars, being intermediately fixed upon the rear axle of the wagon.

HORSESHOE.—James Maslen, 247 West 125th Street, New York City. This shoe has a detachable sole, removable calks, and fastening screws extending through the bed plate and sole and into the calks. It affords protection to the hoof, and is cheap and durable, as the bed plate will last for years, while the soles can be changed to suit the going. The leather and rubber sole prevent jar to the hoof and give a firm foothold, and the sharpened steel sole gives a firm foothold on ice or packed snow. No nails are used to split the hoof.

BRAKE FOR INK ROLLERS.—Emil Meier, New York City. This is an inexpensive spring brake attachment more particularly designed for application to the ordinary angle or distributing rollers of printing presses. It is adjustable to fit rollers arranged at different distances apart, clasping the shafts in such a manner as to permit the usual endwise and necessary rotary movements, but preventing the rollers from rotating excepting when in actual contact with the ink table.

PERPETUAL CALENDAR.—Charles E. Vawter, Crozet, Va. This calendar has a numbered and lettered face, and numbered and lettered movable piece, there being holes in the face of the calendar and a colored clip arranged behind the holes, while the perforated and marked lower end of the movable piece is arranged to swing between the colored clip and the perforations in the face of the calendar. It may be readily adjusted for any year, being then good for the whole year, and is adjusted as easily for one date as another.

PAVING BLOCK.—Irvin G. Poston, Veedersburg, Ind. This block has in each of its opposite vertical faces two horizontal grooves intersected by transverse grooves that run out to the upper and lower edges of the block, allowing a filling of melted pitch to be poured between the blocks when laid in the pavement, forming a locking key partly embedded in the groove of one block and partly in the coinciding groove of the next block.

SUPPORTING CARPET ROLLS.—Charles L. Taylor, Louisville, Ky. This invention provides a novel device for the support and rerolling or unrolling of carpets of good quality, lightening the labor of handling a large roll, quickening the operation, and avoiding injury to the edges of the carpet. The invention comprises a central disk-like hub with central socket in its underside to receive a pivot stud, and a series of radial bars projecting from the hub, there being a binding band on the outer edges of the bars.

MATTRESS FILLING MACHINE.—Elijah T. Gaskill, New Berne, N. C. This invention comprises a table frame with tick-holding devices, a filler-holding carriage or box reciprocating on the table, with filler compressing devices and means for reciprocating the carriage into and out of the ticking. The construction is simple and the machine is easily operated.

STEP LADDERS.—Sydney E. Allen, Winston, N. C. A combined brace, clamp, step fastening and support are included in this improvement, which comprises a sheet metal body of right-angular shape, having on its side edges teeth at an angle to the adjacent flat surfaces, and with two sets of flexible claws or toothed arms which project from the ends of the flat portions of the body. The steps are thereby readily and firmly connected with the legs of the ladder, dispensing with mortise and tenon, the steps being also readily detached.

NECKTIE FASTENER.—William C. McDougall, Cheboygan, Mich. This fastener consists of a slotted shield, to which is pivoted a hook to hook on a stud or button on the neck band, a metal guard being bent over the edges of the slot and secured by clips, and a latch plate pivoted to both shield and guard, while a U-shaped spring attached to the guard and latch plate lies flat on the latter.

GARMENT FASTENER.—Archibald Picken, Roanoke, Va. This is a device in the nature of a hook and eye, which, when brought together, will be fastened at the exact point where left, without carrying the hook a distance beyond the catch, to come forward again after being caught. The hook has a flat body portion, with one or more rearwardly inclined prongs, and the catch has two parallel bowed portions held together by spring tension.

BACK BRACE.—Jose Gallegos, Ocos, Guatemala. This is a support comprising a spine bar and adjustably connected side bars united at their lower ends by a waist bar, all loosely connected with one another, while elastic portions connected with the bars may be adjustably and detachably fastened to each other. The brace facilitates the exertion of various muscular efforts, and also enables one to carry greater loads than would be possible without its help.

SCISSORS HOLDER AND POINT GUARD.—William Chandler, North Bend, Canada. This is a skeleton elongated frame bent from a single piece of wire, a ring being formed at the top, from which bent limbs project between the bows of the scissors when they come together, while the lower end of one wire is bent to form a coniform cup to receive the point. A spring keeper clip secures the scissors in the holder.

BOTTLE STOPPER.—Cevedra B. Sheldon, Brooklyn, N. Y. A stopper which will prevent the refilling of a bottle after it has been emptied of its original contents has been designed by this inventor. The neck of the bottle is provided with a valve guard having a circuitous passage to prevent the introduction of a tool, there being on the inner side of the guard a valve and valve-actuating spring which are protected against acids. The stopper is inserted with the valve and cemented, and the guard applied, after the bottle has been filled.

FUNNEL.—Charles W. Beall, Saratoga, Wyoming. This funnel is particularly adapted for filling lamps with opaque sides, and similar uses, closing automatically when the receptacle is almost full, to prevent running over. A float-carrying lever is connected by a rod to a valve controlling the funnel outlet. When the funnel and float are raised from the vessel the float drops, so that the remaining liquid in the funnel flows into the receptacle, the funnel and float having been correspondingly gauged.

ECRASEUR.—Michael McNalley, St. Louis, Mo. This invention relates to a gelding device involving ligatures attached to an adjustable holder, the ligature holder and operating devices being so constructed that it may be conveniently and effectively manipulated.

DRENCHING BOTTLE.—John T. Turner, Jamestown, North Dakota. This bottle has a large bottom and contracted outlet, a protecting covering closely fitting and inclosing the bottle, while a funnel is adapted to enter the smaller end of the bottle when its cap is removed. It is designed for conveniently dosing an animal without spilling the medicine.

INSECTICIDE.—Ludwig and Ernest Brumleu, Cuero, Texas. This is a poison to be used instead of Paris green or London purple, and it may also be easily converted into a beautiful green powder for advantageous use as a pigment. It is made of ferric oxide, arsenious acid and sulphate of lime, combined in a novel way.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

PRACTICAL LESSONS IN FRACTIONS BY THE INDUCTIVE METHOD, ACCOMPANIED BY FRACTION CARDS. By Florence N. Sloane. Boston, U. S. A.: D. C. Heath & Co. 1894. Pp. xxvi, 92. Price 40 cents.

One of the saddest lessons that the teacher has to learn is that most progress is made by keeping along with the average intellect of the pupil by going very slowly, by teaching little and teaching that little thoroughly. It is only such intellects as that of Sir Isaac Newton that can afford to treat geometry as something too elementary to be worthy of study. This work is by a lady teaching in the Edward Everett School, in Boston, who teaches fractions by the use of diagrams, models and interesting problems, and we believe that it will be found an exceedingly valuable text book in schools where thorough work in arithmetic is an object.

TECHNICAL DRAWING SERIES. ELEMENTS OF MECHANICAL DRAWING. Use of Instruments, Geometrical Problems and Projection. By Gardner C. Anthony. Boston, U. S. A.: D. C. Heath & Co. 1894. Pp. 98. Price $1.50.

What we have said of the preceding work applies to this one, which treats this subject from the lowest level of simplicity and develops its subject to a reasonably advanced standpoint from the simplest elements. The plates are so arranged that when they are open and the book closed all of the plate is visible. This is the more necessary as the binding of the book is of that unfortunate description which precludes the possibility of keeping it open without some special effort.

THE ANIMAL AS A MACHINE AND A PRIME MOTOR, AND THE LAWS OF ENERGETICS. By R. H. Thurston. New York: John Wiley & Sons. 1894. Pp. 97. Price $1. No index.

The treatment of the animal from the standpoint of thermodynamics has long been a favorite idea with writers on these subjects. We believe that Professor Thurston's work will be found very, interesting, and his data in regard to work done and food consumed while doing it are very interesting, as derived from all sources. Haulage of vehicles is excellently treated from the standpoint of the parallelogram of forces. We regret the want of an index.

ANIMALS' RIGHTS CONSIDERED IN RELATION TO SOCIAL PROGRESS. With a bibliographical appendix. By Henry S. Salt. Also an essay on vivisection in America. By Albert Leffingwell. New York and London: Macmillan & Co. 1894. Pp. x, 176. Price 75 cents.

This is a very curious book; it treats of the subject of animals' rights in relation to vivisection and kindred topics, giving animals a standing in the world of ethics comparable to that enjoyed by man. While the tendency of the book is, of course, toward the best possible results in the abolition of cruelty, the treatment of it is a little one-sided. Its distinctive point is that it treats the subject of humanity to the lower creatures largely on the basis that there is no such difference between the rights of man and the rights of animals as is usually assumed to exist. In a letter given in a foot note on page 131 the case seems to be put in a nutshell. Vivisection in American institutes of learning receives considerable attention, and in the concluding sentence of the work numerous letters from college presidents are given, to show how extensively vivisection is practiced in the colleges of this country.

THE GOSPEL OF BUDDHA ACCORDING TO OLD RECORDS. Told by Paul Carus. Chicago: The Open Court Publishing Company. 1894. Pp. xiv, 275. Price $1.50.

Buddhism seems to be very fashionable just now. In his preface the author states that the bulk of the contents of the book is derived from the old Buddhist canon, and that besides the three introductory and the three concluding chapters, there are only a few purely original additions. While we cannot pretend to be especially familiar with Buddhism, it does seem as if in a book of this sort it would, perhaps, be well to draw more exact distinction between the original and the added matter. The fact that in reading one may be reading original or merely translated matter without knowing which, to our mind, detracts from the value and interest of the book.

THE RISE AND DEVELOPMENT OF ORGANIC CHEMISTRY. By Carl Schorlemmer. Revised edition. Edited by Arthur Smithells. London and New York: Macmillan & Co. 1894. Pp. xxiv, 280. Price $1.60.

The barren statement of facts in organic chemistry is usually pretty dry and makes very unattractive reading. This work, which is in some sense a posthumous one, and has had a careful revision by Professor Smithells, really makes most interesting reading. The subject of organic chemistry is given in form, with dates of discovery, notes of discoverers, and of their work, so as to make a consecutive treatment of the subject. As an example of the careful editing, we will particularly remark on the fullness of two indexes, one an index of authors' names, the other the index of subjects; authors, of course, is to be interpreted as authors of various discov-

cries, not merely of books. A beautiful photogravure of Professor Schorlemmer is used as frontispiece. While chemistry is, in many ways, a disappointment, the present work will be found a most valuable contribution to chemistry from an almost new aspect.

THE TELEPHONE HANDBOOK. By Herbert Laws Webb. Chicago, Ill.: Electrician Publishing Company. 1894. Pp. 146. Price $1.

This little book is quite clearly described by its title. It is compactly printed, adequately illustrated and contains an index. The subject is not very deeply gone into, and we believe its descriptions of telephone practice, with the accompanying diagrams, will be of interest and value to many.

MANUAL OF PHYSICO CHEMICAL MEASUREMENTS. By Wilhelm Ostwald. Translated by James Walker. London and New York: Macmillan & Co. 1894. Pp. xii, 255. Price $2.25.

This admirable work on measurements derives interest from being, in a great measure, a description of experiments. It is an excellent illustration of what we are growing to recognize as German thoroughness, all the minor points of the work being as closely considered as the other portions. It differs from recent works on the same subject that we have had to review in precisely this thoroughness and in the utilization of the best methods rather than the simplest methods, the latter attaining, to our minds, often an almost vicious importance in the American treatment of inductive work in science. In this work the author designs to tell how work can be well done, not merely how the mere forms of work can gone through most readily.

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Theoretical and Practical Ammonia Refrigeration. J. J. Redwood. Illustrated, tables. Cloth (in the press), $1. Spon & Chamberlain, 12 Cortlandt St., New York.

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $4; Munn & Co., publishers, 361 Broadway, N. Y.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.
Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.
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Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(6317) W. S. asks: 1. What is the horse power of a cylinder of steel 3 inches long, 3½ inches wide, revolving at the speed of 15,000 revolutions a minute on a ⅜ inch shaft? What must the speed of the cylinder be to generate 1 horse power? Is it true that the higher the speed, the less power you get? If it is true, how is it that the De Laval steam turbine generates 20 horse power at 30,000 revolutions a minute? A. The solid cylinder while revolving at the high velocity stated would have 2¼ horse power by its momentum alone, which would diminish to 0 in a few moments by the giving out of its unsustained power. A little less than one-half the speed will be equal to one horse power under the same conditions. The power derived from momentum of a mass or weighty body increases with velocity, and when the velocity is sustained by a power, as in an electric motor, steam turbine, or impact water wheel, the power is also sustained in terms of the factors of momentum and velocity.

(6318) M. H. J. writes: Will you please inform me what will be the effect of loose steam turned in one of the patent drying kilns in case of a fire? I refer to drying kilns such as are built by the Sturtevant Dry Kiln Company, the Reliance Patent Dry Kiln Company, and the Standard Dry Kiln Company. A. Steam is an extinguisher of flame, and if turned into a drying kiln on fire, will extinguish the flame, and finally extinguish the ignited wood, if kept on long enough, and the kiln thoroughly saturated with wet steam. The only difficulty that might arise will be in turning off steam before the ignited wood is cooled, when the admission of air may again start the flame.

(6319) E. R. asks: Why is it that brick chimneys always lean toward the north after they have been several years built? Also, how to find the length of the outside line of a segment of a circle when the length of the chord and rise of arc are known. A. Mortar in walls and chimneys is subject to change of constituents by the presence of moisture and carbonic acid gas in the atmosphere. The mortar, which at first is a hydrate of lime and sand, gradually changes to a carbonate in its lime element; thereby increasing its bulk to a small extent. On the storm-wet sides of chimneys subject to repeated changes of temperature by sunshine, the process of the elemental change probably goes on somewhat faster than on the shady side; which, with the additional change due to a slight disintegration of the mortar by the continual change of temperature on the sunny side, gradually lifts one side faster than the other, producing the observed cant in chimneys and columns. The internal heat of a chimney cannot be assigned as a cause of unequal expansion of the sides, because it is of equal effect on all sides. For length of arc, multiply square root of sum of square of chord and four times square of versed sine by ten times square of versed sine; divide this product by sum of fifteen times square of chord and thirty-three times square of versed sine; then add this quotient to twice chord of half arc, and sum will give length of arc very nearly. This rule is worked out with an example in Haswell's "Engineer's Pocket Book," chapter on mensuration, $4 by mail.

(6320) G. W. asks: How long would a tank containing ten cubic feet of compressed air, at a pressure of two hundred pounds, run a one-half horse power motor? What would be the most suitable motor to use in this connection? What power would a twelve foot windmill develop at 50 revolutions per minute? A. At 200 lb. pressure the cylinder will contain 14⅓ volumes or 143 cubic feet of free air. It requires 12 to 14 cubic feet of free air per horse power in small engines, so that the time could not exceed a 10 minute run, unless the air can be heated before entering the engine to about 300° Fah., when the time could be extended to 15 minutes. The most economical form of steam engine is the best air motor. A well designed windmill of the size and at the speed named should develop ¼ horse power.

(6321) G. W. P. writes: My line wire terminates at each end in a tensional diaphragm of raw hide for signaling purposes, the wire being suspended from loops of hemp cord, instead of using the usual insulators, the insulation being secured by the perfect dryness of everything in this climate for most of the year. 1. Would such an arrangement hinder the working of the telephone over the same wire? A. Your line will answer, we think, for electric telephoning. 2. Does an iron pump stock furnish an efficient grounding medium, the supply pipe of course ending in water? A. Yes.

(6322) F. C. W. asks: How can I change the shape of a piece of aluminum? Can it be melted and cast in moulds the same as lead, or will it have to be worked the same as wrought iron? A. Aluminum can be hammered, rolled, and drawn the same as brass, only requiring more frequent annealing, which should be at low temperatures, 400° Fah. makes it soft enough for ordinary working. It can be easily cast in iron moulds for ingots, and in sand moulds with patterns; an ordinary plumbago crucible is used; flux is not needed, but common salt only is used when scrap metal is to be melted.

(6323) I. S. asks: I have four storage cells, each having 72 square inches positive plate. What is the best kind of battery, and how many would it take to charge them? I have used gravity battery and found it very unsatisfactory. A. You will require a current of 3 amperes to charge your battery. You may use a bichromate battery for the purpose. It is better to use a mechanically generated current for economical reasons. The gravity battery is cheaper than the bichromate, but is much slower.

(6324) G. A. W. F. asks: How many and what gases enter into the composition of air? Is there any truth in the alleged discovery of a third gas as a component part of air, in addition to those now recognized, viz., oxygen and nitrogen? A. We refer you to our SUPPLEMENT, No. 977, "Chemistry at the British Association," for some notes on the new gas, one of the most interesting discoveries of the year.

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